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Characteristics and Utility of Neoprene Latices

Benton Dales[1]

NEOPRENE latices are aqueous dispersions of polychloroprene formed by the polymerization under controlled conditions of 2-chloro-1,3-butadiene which has been dispersed in water with the aid of emulsifying agents. The products resemble natural rubber latex not only in appearance, but in most important reactions. They may contain up to 50% total solids, which may be recovered by simple evaporation of the water. The Neoprene may also be recovered from the latices as a coherent plastic lump resembling rubber similarly obtained from rubber latex by precipitation with alcohol, acids, salts of bi- and tri-valent acids and other coagulants. These coagula, when washed with water and dried, become commercial Neoprene and rubber respectively. Neoprene latices may be compounded similarly to rubber latex, and films from those mixes that contain the proper ingredients may be vulcanized. Neoprene articles may be made from the latices by processes essentially the same as those for making rubber articles from rubber latex.

Particle Structure and Concentration Characteristics

Neoprene latices are colloidal systems of much interest. The 2-chloro-1,3-butadiene is present in a fresh emulsion as spherical particles mostly of two to four microns in diameter, with some considerably larger. These particles are easily visible by direct illumination in a microscope. If the emulsion is observed for a time under the microscope, the spherical particles will be found to disappear in different parts of the field of vision. Ultimatel yall will disappear as the course of polymerization of the chloro-butadiene is completed. They are replaced by particles which are very uniform in size and about 0.1-micron in diameter. If dark field illumination is now substituted for direct, the field which appeared clear will be found to be filled with bright rapidly moving points of light.

[1] Rubber Laboratory, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

The particles of polychloroprene have such a lively Brownian movement that they will not settle in spite of their specific gravity of 1.25. The Neoprene latices differ from rubber latex in this property of separation of particles on standing; in rubber latex the particles of rubber rise and concentrate in the upper portion of a sample.

The small particle size and lively Brownian movement of the Neoprene latices prevent natural downward creaming as a method of obtaining a more concentrated latex. Some substances are known which produce flocculation and a little settling, but creaming agents of commercial importance are not yet available. The centrifuging process by which rubber latex is concentrated is more difficult to apply to Neoprene latices; the uniform and small particle size and rapid Brownian movement of the particles make the speed at which the centrifuges work with rubber latex of little effect upon Neoprene latices. The high specific gravity of Neoprene, which has been previously mentioned, is a more important contributor to centrifuging difficulties. If the centrifuge is made to go fast enough to cause separation of the latices into serum and concentrate, this higher specific gravity results in packing the Neoprene concentrate quite firmly against the outside wall of the centrifuge instead of moving it toward the center as rubber is moved in rubber latex. This means that continuous operation at effective separation speeds would be at least very difficult.

Evaporation, after the addition of extra stabilizer, offers perhaps the simplest method of increasing the total solids, but the concentration of latex above 50% solids has not yet been developed on a commercial scale.

Stability and Alkalinity

Rubber latex carries its own antioxidants and usually may be kept for long periods by addition of alkali. The present Neoprene latices are made alkaline and should be kept so, and an antioxidant is usually added to counteract the possible destructive action of oxygen. Neoprene is attacked by oxygen, but to a less degree than rubber, probably because some of the valences which offer points of attack for oxygen in the rubber hydrocarbon are in the somewhat similar Neoprene compound already attached to chlorine. There are, however, two factors operating to make Neoprene latex unstable with time, which

are practically non-existent in rubber latex. One of these is that Neoprene, especially in the form of latex, continually evolves traces of hydrogen chloride, chiefly perhaps as the result of hydrolysis. Hydrogen chloride will be formed also if oxygen acts on the Neoprene. Added alkali does not prevent the formation of this acid (as is indicated by the steady decrease of the pH of the latex with time). The other factor is that this hydrogen chloride, though neutralized by alkali, increases the electrolyte content of the latex and decreases its stability. The types of dispersing agents which must be used in the manufacture of Neoprene latex produce dispersions which are much more sensitive to the presence of univalent electrolytes than is rubber latex. An electrolyte concentration is reached after a period of time at which the latices become too unstable for compounding, though they may not coagulate if compounding is not undertaken. This period depends chiefly upon the purity of the materials of which the latices are made, the conditions under which they are made, and the conditions of storage. The period is of the order of three to six months, which makes it desirable to use the Neoprene latices within two months of the date of manufacture. Latex compounds, unless heavily stabilized, have less storage stability with time than the uncompounded latices and should generally be used within two to three weeks.

Two Neoprene latices, Type 56 and Type 57, are made at present; the properties of Type 57 make it the preferred general purpose latex. The 2-chloro-1,3-butadiene is emulsified with a different dispersing agent for each type, and polymerization is made to take place under different conditions. For these reasons the two latices and the Neoprene from each have slightly different properties. While Type 56 latex has greater storage stability than Type 57, the compounds of the latter are more stable than those of Type 56. Each latex has about the same pH of 10 to 11 when fresh. The pH of Type 56 latex may fall to two or even less without the occurrence of coagulation, but Type 57 latex coagulates at a pH near seven. Type 56 latex, however, cannot be compounded with any of the usual compounding ingredients if its pH is below seven. Compounded Type 57 latex may be made to gel like rubber latex mixtures, and in some other processes also it more nearly resembles rubber latex than does Type 56. The Neoprene from Type 57 latex does not stiffen or "freeze" at room temperatures; while that from Type 56 does.

Type 56 latex and mixes may be sprayed without using added stabilizer; they are preferred by some concerns for this purpose and for use in various kinds of surface finishing as on leather. The Type 56 mixes find use, too, in metal coating because they yield somewhat thicker films by standard coagulating dip processes than do similar compounds from Type 57 latex. In this use the tendency of Type 56 latex films to "freeze" is not important. If Type 57 mixes are to be sprayed, they should be stabilized with 0.5 to 1%, calculated on their Neoprene content, of the sodium salt of one of the higher alcohol sulphates.

In spite of the greater storage stability of uncompounded Type 56 compared with Type 57, if mixes of the former containing zinc oxide are to remain stable for any length of time, an effective stabilizer, such as a betain product, must be added. Another difference in the effects of compounding in the two latices is that the action of the vulcanizing aids is less pronounced in Type 56 mixes.

Compounding Procedure and Effects

A study of the compounding of these latices has revealed some striking results. Films from uncompounded latices, dried and cured, have a good tensile strength with a high elongation at break and very low moduli at elongations of 600% and 800%. Films from latices containing the right ingredients may be vulcanized; the process and the result are similar to the vulcanization of rubber films from suitably compounded rubber latex. Zinc oxide and a rubber accelerator, principally of the dithiocarbamate or thiuram polysulphide classes, are the common vulcanizing ingredients. These accelerators have, especially in Type 57 latex mixes, a pronounced vitalizing effect upon the vulcanization of the Neoprene, causing an increase in both modulus and tensile strength of the vulcanizate. The addition, for example, of five parts of zinc oxide and one part of a dithiocarbamate accelerator to 100 parts of Neoprene, as Type 57 latex, will increase the modulus at 600% of Neoprene cup films cured 30 minutes at 284° F. from 50 to 250 pounds per square inch and the tensile strength from 2,500 to 4,000 pounds per square inch. They do not, however, materially reduce the time required to vulcanize the Neoprene. The water-soluble dithiocarbamates have some tendency to reduce the viscosity of Neoprene latex mixes, but they have also a favorable effect upon the stability of the mixes. This last characteristic is especially true of sodium dibutyl dithiocarbamate, and it is, therefore, the preferred vitalizer.

Many filling ingredients, such as lithopone, blanc fixe, clays, titanium dioxide, and carbon blacks, which are inert or nearly so in rubber from latex have a definite reenforcing action upon cured Neoprene from latex compounds containing them. Whiting and barytes are inert diluents in both Neoprene and rubber from their latex compounds. Each of these ingredients is of value for some particular uses, but lithopone appears to be the best filler for general purposes. Zinc oxide has a reenforcing action, but is of greater importance as one of the vulcanizing aids for Neoprene from latex. In addition zinc oxide increases the resistance of Neoprene from latex to aging in the oxygen bomb at 158° F. and 300 pounds per square inch oxygen pressure, and it is an acid acceptor. Sulphur is not needed for the vulcanization of Neoprene; cured films from latex mixes to which sulphur has and has not been added have about the same tensile strengths. Dispersed sulphur, however, seems to improve the working qualities of a latex mix.

The reenforcing effect upon Neoprene of lithopone, zinc oxide, and certain carbon blacks added singly to Neoprene latex is illustrated by the figures in Table 1.

Table 1. Tensile Strength and Modulus of Neoprene Films from Latex Containing Single Ingredients

Type of Latex	Ingredient Added per 100 Neoprene	Modulus at 600%	Tensile Strength	Elongation at Break %
56	None	100	2,775	1,140
	10 Lithopone	300	3,225	1,110
	10 Reenforcing Black	650	3,175	1,030
57	None	50	2,450	1,300
	10 Lithopone	225	2,775	1,250
	10 Zinc Oxide	275	2,825	1,230
	10 Semi-reenforcing Black	275	2,675	1,280

All films were cured in air for 30 minutes at 284° F.

These mixtures, of course, do not represent satisfactory commercial compounds. The films were made from the latex or mixes by application of reduced internal pressure for 30 minutes upon porous cylindrical cups placed in the liquid; the cups were washed immediately prior to this use by a few minutes' immersion in 2% aqueous ammonia under reduced internal pressure. The films thus obtained were allowed to dry in air and were then cured as shown. The usual "poured" plate films of the type made for test purposes from rubber latex are very difficult to make from Neoprene latex, especially if this is uncompounded. Cup films are easily prepared and ap-

proach plate films in composition more nearly than other practical types. All results given in this paper were obtained using such films.

Antioxidants are added to Neoprene latex, as has been mentioned, for the same reason that they are usually added to rubber latex compounds. Undoubtedly in some cases no antioxidant is needed in the Neoprene latex compounds because of the inherently great oxidation resistance of Neoprene. However the prevalence of oxygen bomb aging as a test for the durability of rubber and rubber-like materials makes the addition of some antioxidant to Neoprene latex compounds desirable.

The water absorption of the films is lowered by adding to the Neoprene latex compound zinc stearate (0.5 to 0.75% on the Neoprene). The stearate is more easily dispersed with other pigments than by itself. The obvious method of washing Neoprene films with hot water to remove water-soluble material is not very effective as a means of lowering water absorption.

The general methods of preparing dispersions of single ingredients or groups of them and of making Neoprene latex mixes are the same as those employed in rubber latex compounding. Dispersions are made up to 50% concentration in water, using generally 3% of casein in aqueous solution as ammonium salt and 1% of a dispersing agent, such as the sodium salt of the formaldehyde condensation product of beta-naphthalene sulphonic acid. Pebble mills or colloid mills may be used. Carbon blacks should be ground with 5 to 8% of naphthalene sulphonate to make a 15 to 20% dispersion. Color pigments should be dispersed with casein and the naphthalene sulphonate at 25% concentration. Pebble mill grinding for 48 hours is advantageous for both blacks and colors. In preparing the latex mixes, the stabilizers, if any, should be added first to the latex, then the fillers and the vulcanizing agents. The vitalizer is usually added last, though sodium dibutyl dithiocarbamate (used in aqueous solution) may be added before the fillers.

The viscosity of either type of Neoprene latex may be increased by the addition of such substances as gums, gelatin and casein, and bentonite. Casein in amounts of 0.5 or 1%, calculated on the Neoprene, is a useful thickener; its chief disadvantage is that the thickening produced is not permanent. Viscosity increases are also brought about by additions of small amounts of some high molecular weight water-soluble polymers used generally as 5 to 10% solutions. Thickening is usually desirable in dipping operations with mixtures from either Neoprene latex.

The tendency of Neoprene films to reduce the strength of latex impregnated cellulosic materials, due to the evolution of minute quantities of hydrogen chloride, is decreased by incorporating zinc oxide, carbon black, and potassium fluoride into Type 57 latex mixes. Sodium carbonate or trisodium phosphate may be used instead of potassium fluoride. An effective stabilizer, such as a betain product, is necessary to prevent coagulation of the latex by these salts. An alternative method of protecting cellulose is to deposit on the fibers lead fluoride or magnesium carbonate. This is done by successive treatment of the cellulosic material with a water solution of a lead or magnesium salt and then with an excess of water solution of alkali fluoride or carbonate. If this latter method is used, the alkali salt can be omitted from the mix. The cellulosic material will be less affected if the Neoprene layer on it is heavy than if it is light.

Properties of Cured Films

The best general cure for articles or films of Neoprene from latex or compounds is 30 minutes at 284° F. in hot air. Steam cures at the same temperature are satisfactory; the tensile strength obtained is about the same as for the corresponding air cure. At 250° F. a curing time of 90 minutes and at 212° F. of four hours will be necessary to obtain a corresponding cure. A well-dried film of Neoprene from compounded latex will have, after four or five days' storage at room temperature, about 75% of the tensile strength that would be obtained by proper cure, but it will not feel so "rubbery" as the heated film.

Properly cured films from Neoprene latex mixes have the characteristic Neoprene properties of superior resistance to oils, heat, and oxidation. Although they will burn while in contact with a flame, they cease to burn when the flame is removed. They are less permeable to gases than films from rubber latex. Films from Neoprene latices will darken on heating or on exposure to sunlight. The change from yellow toward brown in films from uncompounded latex prevents Neoprene from being used for making articles in pastel or light shades if prolonged exposure to sunlight is involved.

The formula given below is that of the general basic compound from Neoprene Latex Type 57. This compound forms the best general starting point for an investigation into the advantages of Neoprene from latex for most products. A few exceptions, such as some coatings on metal and surface finishes as on leather, have been mentioned. The figures given in the formula represent dry weights of ingredients.

Neoprene (as Latex Type 57)	100.0
Lithopone (Dispersed)	10.0
Zinc Oxide (Dispersed)	5.0
Sulphur (Dispersed)	2.0
Phenyl-beta-naphthylamine (Dispersed)	2.0
Sodium Dibutyl Dithiocarbamate (Aqueous Solution)	0.8

Cup films made from this compound, dried and cured for 30 minutes at 284° F., will have a tensile strength of 3,500 to 4,500 pounds per square inch with an elongation at break of about 900% and a stress at 600% of about 600 pounds. Fourteen days' aging in the bomb at 300 pounds' pressure per square inch of oxygen and a temperature of 158° F. seldom lowers, but often raises the film tensile strength by as much as 10%. The kerosene absorption after 48 hours at 212° F. will be about 75% by volume. The water absorption after 48 hours at 212° F. will be 55 to 60% by volume; this may be reduced to about 25% by the addition of 0.5% of zinc stearate to the basic compound.

Typical Applications

The special characteristics in which Neoprene is superior to rubber have led many experimenters to study the use of Neoprene latices in the manufacture of household and industrial gloves, coated canvas gloves, gaskets in combination with various materials, flexible heating pads, waterproof clothing, leather dressings, paints, prophylactic goods, wire insulation, fabric impregnation of various sorts, printers' blankets, V-belts, tubing, actors' face masks, etc. Neoprene latex mixes have been used in the making of various roofing mixtures, in mixtures for joints in concrete roads, and as a fire-resisting preservative of the freshness of natural vegetation in motion picture sets. Froth sponge is another possibility where the relative lack of combustibility makes the product of interest to passenger carriers and theater seat manufacturers. Thread, both cut and round, may be made. Tanks can be lined with or without rubber between the metal and the Neoprene. A protective for conduit joints can be made. Dish racks, soap racks, plating racks may be coated. Also cans may be sealed with Neoprene latex as with rubber latex compounds.

Testing Elastic Thread by the Incline-Plane Machine[1]

Daniel Rhee[2]

IN PRODUCING rubber thread the manufacturer is constantly called upon to furnish thread especially formulated to produce definite modulus and tensile properties as required by the particular needs of various elastic thread users. In this formulation adequate testing equipment is vital. In addition, once the desired formulae have been established, manufacturing routine involves regular testing as a check on uniformity of production.

Test Apparatus and Method

For experimental and routine testing a sensitive type of machine known as the incline-plane tester, enables the determination, in "picturized" form, of the initial pull and recovery of rubber thread. Because of the ease of changing loads, the possible range of testing is such that single strands may be tested as well as multiple ends.

On the incline-plane machine, stress is applied to a specimen of predetermined length by means of a rolling weight which moves freely on an inclinable plane. One end of the rubber thread is clamped to a fixed jaw on the plane, and the other end to the rolling weight carriage. Driven by a motor, the plane is inclined from the horizontal at a constant rate, and the weighted carriage rolls sidewise and stretches the specimen.

Both the horizontal and the vertical motions are automatically recorded. The resulting graph pictures in sidewise motion the actual stretch of the thread; while the load applied is represented on the vertical scale.

In physical testing of rubber thread the interest in tensile strength is secondary. Of primary importance are both the moduli at 200 to 500% elongation and the characteristics of recovery.

The manufacturer is particularly interested in: (1) the desired degree of resiliency; (2) a reasonably low degree of hysteresis; and (3) uniformity throughout the production cycle.

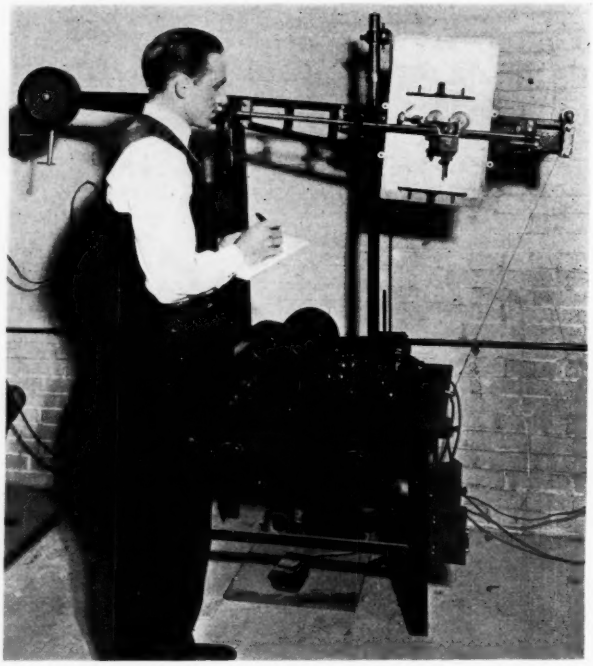


Fig. 1. Scott Incline-Plane Testing Machine in Operation, Set to Reverse Automatically and Show Recovery Curve after Given Stress Has Been Applied

Resiliency

The graphs[3] shown in Figures 2 and 3 are examples of the range of resiliency that can be obtained by varying the formula within the same size of thread. In Figure 2 a stress of 0.3-pound stretches the thread to 525% of its original length; while the thread in Figure 3 is stretched to only 390% of its original length by the same 0.3-pound stress applied at exactly the same rate. Both these types of rubber thread were of the same cross-section. The difference in resiliency was obtained by vary-

[1] Product of Henry L. Scott Co., Providence, R. I.
[2] Carr Mfg. Co., Bristol, R. I.
[3] Owing to minute initial inertia of weight there is a brief plateau in the curve. This feature, however, is not a handicap because we are primarily interested only in relative values.

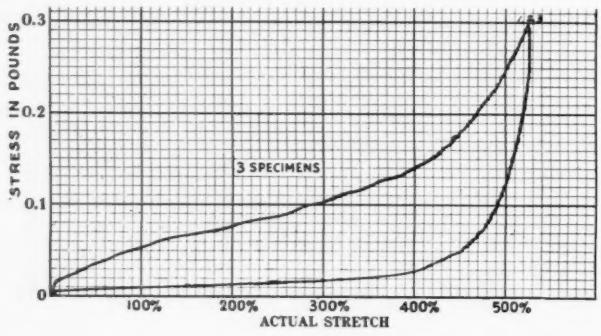


Fig. 2. Thread A

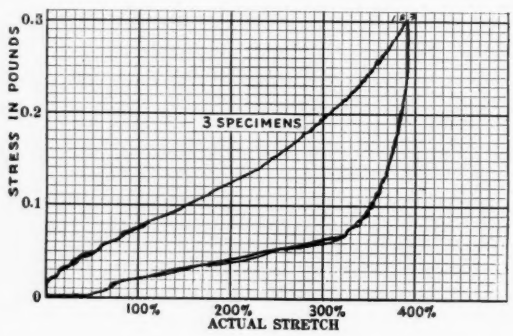


Fig. 3. Thread B

Testing for Uniformity

Each chart shows initial stretch and recovery curves for three specimens selected at random from regular production of each type of thread. Owing to close uniformity, the three curves on each chart show as practically a single line. Thread A and Thread B were of the same cross-section, but had different characteristics.

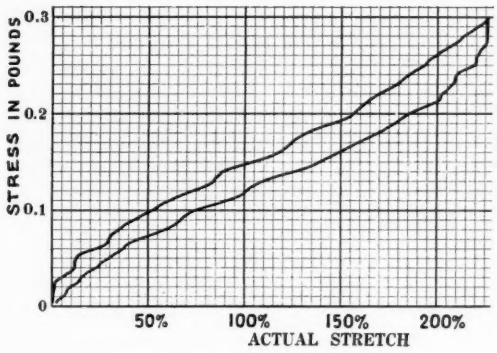


Fig. 4. Thread C Uncovered

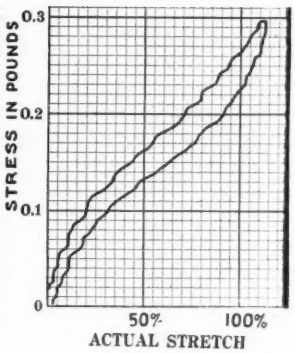


Fig. 5. Thread C Covered

Effect of Textile Covering

Initial stretch and recovery curves for the same rubber thread uncovered and covered. The reduction in length of stretch, as shown in Figure 5 in comparison with Figure 4, is accounted for by the fact that the naked thread received a permanent stretch of approximately 100% during the covering process.

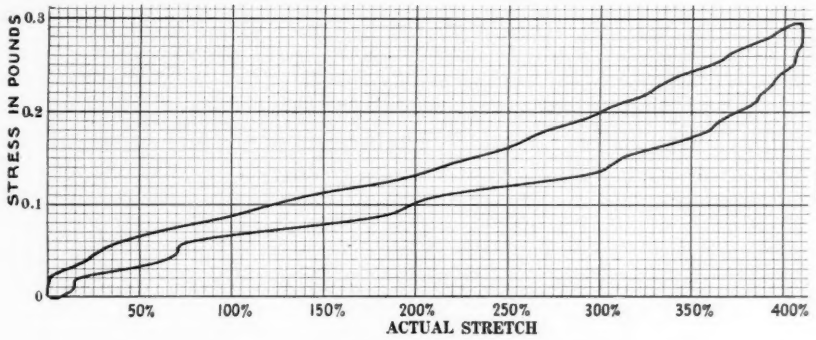


Fig. 6. Thread D Uncovered

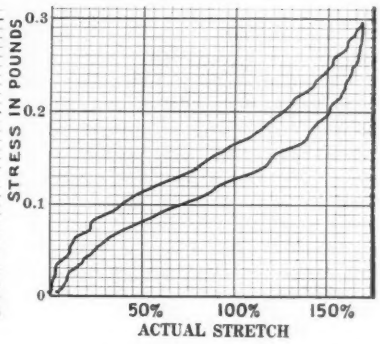


Fig. 7. Thread D Covered

Similar but more pronounced effect of textile covering to that shown in Figures 4 and 5. Thread D is much more sleazy and is used where the required stretch is greater than in the instance of thread C shown in Figures 4 and 5.

ing the rubber compound, which could, of course, be varied to obtain a wide range of resiliency between the two extremes pictured in these charts.

The thread represented in Figure 2 would be described as extremely sleazy, suited to fabrics subject to long stretch, athletic supporters, for example. Yarn made from the thread shown in Figure 3, on the other hand, might be used for garments designed for firm, constant control, such as girdles.

Hysteresis

The subject of hysteresis is one to which much importance is attached, involving as it does one of the basic essentials of elastic thread: namely, that it return to its original shape after yielding to stress. In studying the factor of hysteresis, the incline-plane machine is of great usefulness. As previously noted, at any given angle of inclination of the plane, the load on the specimen is always the same. Therefore it is a simple matter to show on the graph the retraction as well as the initial stretch produced by a specified load. The maximum load applied for a given setting is always constant; while the stretch is variable. The machine is regulated to reverse automatically at a predetermined load, recording a recovery curve back to zero. The factor of hysteresis is clearly indicated as the area of divergence between the recovery line and the initial stretch line. Some technicians prefer to compare the ratio between the area below the return curve and terminated by the abscissa with the area below the initial curve and terminated by the abscissa, known as the "activity coefficient," which is never greater than one.

In this connection there is what is known as the Swartz test, which determines the average modulus at 500% elongation after the thread is stretched to 600% for a certain number of times. Since the Swartz test is based on a constant stretch of the specimen, the incline-plane machine can do this job readily by having a clamp fixed to stop the rolling weight carriage at 600% elongation, at which point the motor is reversed so that the specimen will retract toward the zero point.

In examining the curves in Figures 2 and 3, which represent extreme tests, it should be borne in mind that most elastic threads are rarely subjected in use to a stretch of more than 200 to 300% of their original length. In this instance the specimens were subjected to much more drastic tests, as shown in Figures 2 and 3, because it is important to observe the behavior of the compound when stressed well beyond the conditions of normal use. This reveals the presence or absence of what might be called a safety factor or "performance margin" beyond conceivable demands of actual service.

Uniformity

The subject of uniformity is of great concern to the manufacturer of elastic yarn who converts the naked rubber thread into elastic yarn by covering it in various ways. Uniformity is also of great importance to firms which use

(*Continued on page 53*)

German Patents Relating to Synthetic Rubber-like Materials—I

Law Voge[1]

SYNTHETIC rubber is no longer merely a substitute material appropriate for use only in wartime when natural rubber is obtainable only at much higher prices, if at all. The names "Thiokol," Neoprene, Koroseal, Buna are familiar to all rubber chemists and clearly indicate that synthetic rubber is finding markets for special uses today.

The early technique of this industry, which was developed largely in Germany just prior to the World War, is clearly shown in the patents applied for from 1909-1914, most of which concerned the two great German industrial corporations, Farbenfabrik vorm. Fr. Bayer and Badische Anilin und Soda Fabrik. No detailed presentation of these patents giving their chief claims and illustrative examples of their processes has ever been published in English.

To understand the technique of synthetic rubber preparation, as developed in patent literature, it is necessary to sketch concisely the history of synthetic rubber. The first preparation of isoprene, generally accredited to C. Greville Williams in 1860, was in all probability prepared in 1835-1838 by F. K. Himly who, in the fractional distillation of caoutchouc, isolated a distillate boiling between 33 to 44° C. which he called "Faradayin." He also coined the term "Kautchin" (now dipentene) for the fraction boiling at 175° C.[2] Harries in 1911 recognized that Himly probably isolated isoprene.

The first polymerization of a rubber distillate was described in 1837 by A. Bouchardat, who called the products "doubled hydrocarbons."[3] In 1845 he noted the polymerization of essence of turpentine.[4] Then in 1860, Greville Williams published his classic article on the preparation of isoprene from both caoutchouc and gutta percha, coining the term "Isoprene."[5]

In 1878, Bouchardat stated, "I have already polymerized isoprene."[6]

He had, indeed—as early as 1837. In 1879 the French scientist showed that di-isoprene was identical with terpene, thus associating turpentine with rubber. Here he also describes the polymerization of isoprene in an atmosphere of carbon dioxide—a procedure later covered by German patents.[7]

Then in 1882—not 1884 as some authorities have stated—the Englishman, Sir William Tilden, makes the prophecy: "If it were possible to obtain this hydrocarbon (isoprene) from some other and more accessible source, the synthetic production of india-rubber could be accomplished."[8]

This was probably the earliest expressed thought of the practical use of synthetic rubber. Tilden here too describes the depolymerization of turpentine to isoprene; and treating this product with hydrochloric acid (the Bouchardat reaction) he obtained "a tough substance like rubber." This mere note of 1882 was supplemented in 1884 by Tilden's article[9] describing in detail the preparation of isoprene from turpentine and stating that his product was readily polymerizable to rubber.[10]

Dimethylbutadiene (C_6H_{10}) is another compound which finds prominence as initial material for preparing synthetic rubber, in the patent literature. Its preparation was first described in 1890 by the Frenchman, F. Coutourier, who called it "beta-dipropylene."[11] In 1892 this scientist published a 70-page paper on pinacone and its derivatives, probably the most important early article on the preparation of initial materials applicable to synthetic rubber production.[12]

In 1892 the spontaneous polymerization of isoprene to rubber, on long-standing was discovered by Tilden.[13] Here Tilden calls attention to the fact that this artificial rubber, like natural rubber, contained two components, only one of which was soluble in benzene. He also describes the reaction of this artificial rubber with sulphur—probably the earliest description of the vulcanization of synthetic rubber.

The actual constitution of isoprene was definitely determined in 1897 by the Russian, W. Ipatiew.[14]

Then in 1900-1901 came the first description of the preparation of methyl rubber (polymer of 2,3-dimethylbutadiene) by another Russian, I. Kondakow.[15] This reaction and product of Kondakow form the basis of the majority of the earliest German patents on synthetic rubber.

In 1907 the name of C. Harries first enters the synthetic rubber literature in a German article hinting at the industrial preparation of isoprene. He thinks it feasible, but "nothing has been done."[16] Apparently the earliest patent on the preparation of synthetic rubber is British patent No. 21,772 in 1907 granted to A. Heinemann, covering the heating of isoprene in closed tubes at 100 to 150° C. for three days. The sole originality here seems to be the reduced temperature employed.

In 1908, perhaps stimulated by Harries' article, Tilden in England made the first serious attempt to make synthetic rubber from isoprene. He states, however, very pessimistically:

"The conversion of isoprene to rubber occurs . . . under two conditions: 1. When brought into contact with strong aqueous hydrochloric acid or moist hydrogen chloride gas. 2. By spontaneous polymerization. In the former case the amount of rubber produced is small. . . . In the latter case the process occupies several years. Of

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[1] Research chemist and engineer, Washington, D. C.

[2] "Distillation of Caoutchouc." *Liebigs Ann. Chem.*, 27, 40-42 (1838).

[3] "On the Distillation Products of Rubber." *Liebigs Ann. Chem.*, 27, 30-42 (1838); *J. pharm.*, 23, 454-64 (1837); *Erdm. J. prakt. Chem.*, 13, 114-22 (1838).

[4] "On the Molecular Change in Essence of Turpentine to Permit It to More Readily Dissolve Caoutchouc." *J. pharm.*, 8, 87-91 (1845); *Erdm. J. prakt. Chem.*, 36, 311-16 (1845).

[5] "On Isoprene and Caoutchouc." *Phil. Trans.*, 150, 241-55 (1860); *Proc. Royal Soc., London*, 10, 516-19 (1860).

[6] "On the Transformation of Valerylene into Terpilene." *Acad. Sci., C.R.*, 87, 654-56 (1878).

[7] "On the Identity of the Hydrate of Di-Isoprene and of Caoutchine with Terpene." *Ibid.*, 89, 361-64 (1879).

[8] "Hydrocarbons of Formula $(C_5H_8)_n$." *Chem. News*, 46 120-21 (1882).

[9] "On the Decomposition of Terpines by Heat." *J. Chem. Soc.*, 45, 410-20 (1884).

[10] *Ibid.*, p. 419.

[11] "Action of H_2SO_4 on Pinacone." *Soc. Bull. Chim.*, 3, 3, 499-500 (1890); "On a New Biethylenic Hydrocarbon, Beta-Bipropylene." *Ibid.*, 3, 4, 30-31 (1890).

[12] "Pinacone and Its Derivatives." *Ann. chim.*, 26, 433-501 (1892).

[13] "Note on the Spontaneous Conversion of Isoprene into Caoutchouc." *Chem. News*, 65, 265 (1892).

[14] "Preparation of Isoprene." *J. prakt. Chem.*, 2, 55, 1 (1897).

[15] "Preparation of Dimethylbutadiene." *Ibid.*, 2, 62, 166 (1900); "Polymerization of Dimethylbutadiene." *Ibid.*, 2, 64, 109 (1901).

[16] "On Rubber." *Z. angew. Chem.*, 20, 1265 (1907).

course, many attempts were made by me to hasten the process, but it was found that contact with any strong reagent . . . led only to the production of sticky 'colophene' similar to the substance which results from the polymerization of the terpenes, and after a course of experiments which were carried on for about two years, I was reluctantly obliged to abandon the subject."[17]

In 1910, Samuel S. Pickles showed the importance of physical over chemical conditions in the laboratory synthesis of caoutchouc.[18]

Harries' extensive work on the preparation of synthetic rubber from isoprene was first mentioned in a popular article in 1910,[19] followed in 1911 by his 70-page article in German. He synthesized various members of the butadiene series and polymerized a number of them to synthetic rubber types.[20] This is the first important German article on synthetic rubber, and from this date Germany may be said to have definitely taken the lead in synthetic rubber development throughout Europe. Harries states in this article that in his address of March, 1910, in Vienna, he made public the first practical method for the manufacture of synthetic rubber. The application of glowing metal wire for the decomposition of terpenes (to produce isoprene, etc.) was published at the same time by Harries and Kurt Gottlob.[21]

Fritz Hofmann, who led in the German pioneering patent work from 1909 on, published his first articles on industrial synthetic rubber in 1912.[22]

The German Patents

The synthetic rubber patents of Germany are classified by their Patent Office in the Class 39b, Group 1 (unvulcanized) and Group 3 (vulcanized). These patents will be discussed, not in the sequence of their patent numbers, but in that of the dates of application as more closely approximating the exact date of invention. The nomenclature used in this article is that of the patents. Synonyms for 1,3-butadiene are bivinyl, erythrene, vinylethylene, and biethylene. Synonyms for isoprene are 2-methyl-1,3-butadiene, 2-methylbivinyl, and hemiterpene. The bulk of the patents issued cover butanoid substances.

The earliest German patent (No. 250,690) on synthetic rubber manufacture is that of Fritz Hofmann, assigned to Farbenfabr. vorm. Fr. Bayer & Co., entitled "A Process for the Preparation of Synthetic Rubber," and applied for September 12, 1909, but not granted until December 6, 1912, when its details became public. In this patent, exceptionally, the early work of Wallach, Bouchardat, Tilden, and Heinemann is cited. The claim is on the heating of synthetic isoprene, with or without the addition of polymerizing agents, to temperatures below 250° C.

On September 30, 1909, the Bayer company applied for a second patent on "A Process for Preparation of a Substance Related to Rubber."[23] In the claim of this patent, erythrene (1,3-butadiene) is heated with or without additions assisting polymerization.

An exceptional patent,[24] the claim of which is chemically constitutional, was applied for on December 28, 1909, by Bayer. The claim reads:

"Process for the preparation of materials related to rubber characterized in that substances of the type $\vee C=C-C=C<$ in which the free valences are saturated partly with hydrogen, partly with alkyl radicals (with the exception of erythrene, isoprene, and beta-gamma-dimethyl butadiene) are heated, with or without the addition of dilution agents or catalytically acting substances." *Example:* Alpha-methylbutadiene, is heated in an autoclave 24 hours at 150° C. After cooling the apparatus, the unchanged alpha-methylbutadiene is distilled off and the residue treated with steam as long as terpene hydrocarbons are entrained. The remaining product is a white elastic substance—an isomer of natural rubber.[22]

On December 28, 1909, Bayer also applied for patent[25] on a process the claim of which states that beta-gamma-dimethylbutadiene is heated, with or without polymerizing agents until the resultant product becomes insoluble in alcohol, but is still soluble in benzene.

A supplementary patent[26] to its first one was applied for by Bayer on April 1, 1910, applying the process there claimed to erythrene mixtures with its homologs, and analogs with or without the addition of polymerizing agents. *Example:* Isoprene, 100 parts, cooled erythrene, 100 parts, heated in an autoclave 480 hours [20 days!] at 120° C.; then steam is conducted through, and a rubber-like product results. Polymerizing agents such as acids or acid salts may be used.

The first patent[27] covering the vulcanizing of synthetic rubber is that applied for by the Bayer company on April 7, 1910, and the claim of which specifies that the standard vulcanizing process for natural rubber is applicable to the synthetic rubber-like products produced by their three earlier patents. *Example:* An erythrene polymerization product, five parts, dissolved in benzine, 100 parts. To this is added a solution of one part of sulphur monochloride (S_2Cl_2) in carbon disulphide, 50 parts. The mixture is allowed to stand 1½ to two minutes; then it is poured into alcohol. On stirring, a mass separates out, characterized by increased toughness and chemical resistivity toward various agents.

The first early German patent[28] not applied for by the Bayer company is that of Georges Reynaud, of Paris, on October 23, 1910. While this is entitled "the preparation of synthetic rubber," it does not rate this classification as the product is merely a mixture of natural rubber, turpentine oil, and sulphuric acid.

Cold polymerization of butadiene series compounds was first claimed on December 13, 1910, by Bayer,[29] specifying many unrelated compounds: blood serum, starch, albumin, urea, and glycerine as polymerization agents. *Example:* Butadiene (intensely chilled), 100 parts, wheat starch one to two parts, placed in sealed tube for a month. The product can be well-worked on the rolls. Or, isoprene, 50 parts, urea (finely powdered), five to ten parts. After standing several months a finely workable product is obtained. Or, alpha-methylbutadiene, 50 parts, thiourea, five or ten parts. Or, a mixture of equal parts of dimethylbutadiene and isoprene, 500 parts, blood-serum (sterilized), five to ten parts.

The first patent[30] of the Badische Anilin und Soda Fabrik on synthetic rubber was applied for on March 3, 1911, a year and a half after the first Bayer patent application. It claimed the use of small amounts of sulphur as an accelerating agent for isoprene. *Example:* Isoprene, 500 parts by weight, flowers of sulphur, one part, heated

[17] "Conversion of Isoprene into Rubber." *India Rubber J.*, 36, 322 (1908).
[18] "Constitution and Synthesis of Caoutchouc." *J. Chem. Soc.*, 97, 1085-90 (1910).
[19] "Preparation of Synthetic Rubber from Isoprene." *Chem. Ztg.*, 34, 316 (1910).
[20] "On Hydrocarbons of the Butadiene Series and on Some Synthetic Types of Rubber Preparable from Them." *Liebigs Ann. Chem.*, 383, 157-227 (1911).
[21] "On the Decomposition of Some Terpene Bodies by Glowing Metal-Wire." *Ibid.*, 383, 228-29, (1911).
[22] "Synthetic Rubber from an Industrial Standpoint." *Z. angew. Chem.*, 25, 1462 (1912); *Gumma-Ztg.*, 26, 1794, (1912).
[23] No. 235,423, granted June 10, 1911.
[24] No. 235,686, June 19, 1911.
[25] No. 250,335, Sept. 6, 1912.
[26] No. 255,679, Jan. 13, 1913.
[27] No. 258,151, Mar. 28, 1913.
[28] No. 267,476, Nov. 18, 1913.
[29] No. 254,548, Dec. 6, 1912.
[30] No. 251,370, Sept. 17, 1912.

in an autoclave at 100° C. for five days at a pressure of 6.5 atmospheres. Any untransformed residual isoprene is entrained in a steam-blast.

Application for a patent,[31] March 15, 1911, assigned to the Badische company, covered a process for preparing diolefines. The claim reads: "Dihalogen paraffins or monohalogen alkylenes are treated in vapor form at higher temperature and preferably, under reduced pressure, with solid hydrogen halide compound substances, except the use of iso-pentane dihalide, at ordinary pressure."

On March 24, 1911, Kondakow assigned to the Bayer company application for patent[32] on a process for the acceleration of the polymerization of butadiene and its homologs. The claim covers polymerization by accelerators (unspecified) *"in the presence of rubber;"* for instance, dimethylbutadiene gradually polymerizes to a solid white mass when exposed to daylight in a closed flask, which is insoluble in ordinary solvents.

The first patent[33] publishing the common early defect of synthetic rubbers, that of tackiness, was also applied for by Bayer on March 24, 1911. The products from the previously described processes of patents Nos. 250,690 and 254,548 are said to show this defect frequently after rolling and on air-drying. The claim of the new patent covers the treatment of the isoprene polymerization product with ammonia or aliphatic amines. *Example:* The rubbery substance obtained by heating isoprene in the presence of acetic acid anhydride is rolled out to thin sheets, which are laid in 2% ammonia-water for 24 hours and then dried in the ordinary way in air or vacuum. The statement is made that Pearson had already proposed (1889) to treat natural rubber with ammonia.

In another patent[34] applied for, on March 24, 1911, for the prevention of stickiness of butadiene polymerization products, "excepting isoprene," the claim covers the treatment of the products with alkaline reagents. *Example:* A dimethylbutadiene, acetic acid polymerization product, is rolled out to thin sheets and then subjected for 24 hours to 2% ammonia-water, and dried in air or vacuum.

The discovery that isoprene could be polymerized by metallic sodium was made in 1910, simultaneously and independently by Harries in Germany and Matthews and Strange in England. In July, 1911, this was covered by an application for British patent, followed, on March 21, 1912, by the German application by Bayer.[35] The claim specifies subjecting isoprene to metals of the alkali or alkaline earth groups, their mixtures, alloys, or amalgams in such a manner that the metals are wholly or largely in contact with the vapor of the hydrocarbon. *Example:* Isoprene, 100 parts, placed in one leg of a U-tube (inverted) and metallic sodium, three parts, in the other leg; tube sealed and allowed to stand; only the vapor, not the liquid allowed to contact the sodium. The sodium gradually becomes surrounded with rubber.

Bayer stated in August, 1911, that the Kondakow product of autopolymerization of beta-gamma-dimethylerythrene was very different from the thermal polymerization product from beta-gamma-dimethylbutadiene. To improve the Kondakow product the company applied for a patent[36] the claim of which simply specifies the treatment of the Kondakow product with alkaline reagents.

The second process for the vulcanization of synthetic rubber was the subject of patent application[37] by Bayer on August 8, 1911. The claim covers the treatment of the product covered by the previous German patent No. 250,920[36] to the ordinary vulcanizing processes for natural rubber. *Example:* Kondakow product, 20 parts, sulphur, two parts, well worked together on the rolls; the resultant mass then heated at 135° C. for about one hour.

In the next patent[38] polymerization in the presence of a proportion of previously polymerized product was proposed by Bayer, September 1, 1911. The claim covers the polymerization of beta-gamma-dimethylerythrene accomplished in the presence of some of the polymerization product. *Example:* White Kondakow product, 100 parts, beta-gamma-dimethylerythrene (freshly prepared), 300 parts, placed in a closed container protected from light. After three or four weeks all of the hydrocarbon has changed to the white Kondakow product.

The first German patent[39] of the leading early British manufacturers of synthetic rubber, Francis E. Matthews and Edw. H. Strange, applied for October 24, 1911, covered the use of sodium and related metals, their mixtures, alloys, or amalgams, for polymerization of divinyl isoprene and their homologs.

An earlier patent of Bayer[35] claims the same reaction, but employed the vapor phase of the hydrocarbons.

The lowering of the polymerization temperature considerably was accomplished by the patent[40] applied for by Bayer on November 1, 1911. The claim covers the polymerization process of Kondakow combined with the alkali treatment in one step, at not over 40° C. *Example:* Beta-gamma-dimethylerythrene, 1,000 parts, aniline, five parts, left to autopolymerization. The product, formed after a time, is durable and can be well vulcanized.

The polymerization of benzine distillate or coke-oven gas forms the subject for application of patent[41] on November 1, 1911, by a new inventor, Gesellschaft fuer Teerverwertung, Duisburg. Here a benzine or coke-oven distillate with boiling point under 25° C.; after removal of the sulphur content, is treated with metallic sodium with or without ammonia.

The Bogatyr Co., Moscow, on January 10, 1912, applied for a patent[42] on polymerization products of vinyl halides. The claim specifies that polymerization products of vinyl-chloride or -bromide or their mixtures or analogs be subjected to the action of metals, water, alcoholic caustic potash (potassium alcoholate), or aromatic amines, or merely be highly heated in a liquid. *Example:* Polymerized vinyl bromide, two grams, heated with 30 cubic centimeters of water in a sealed tube or autoclave for 40 hours at 180 to 200° C. The hydrocarbon product is washed with water to remove the hydrobromic acid (HBr) and is then dried with caustic potash.

The improvement of the elastic properties of synthetic rubber to approach those of natural rubber forms the subject of patent application[43] by Arthur Heinemann, of Berlin, on January 19, 1912. He claims: dissolving the synthetic rubber in a solvent (e.g., benzene), adding albumin (or other protein), and gently heating till a "uniform colloidal emulsion" occurs. In the example two parts of albumin are used with 100 parts of synthetic rubber.

Polymerizing isoprene by heat in the presence of viscous liquids forms the claim of the Bayer patent application[44] of January 26, 1912, supplementary to its earliest patent, No. 250,690. Emulsification is produced as with natural rubber, and a product of better physical and chemical properties obtained of especially great toughness and elasticity and but little tackiness. *(To be continued)*

[31] No. 264,008, Sept. 8, 1913.
[32] No. 248,399, June 20, 1912.
[33] No. 257,813, Mar. 14, 1913.
[34] No. 264,820, Sept. 25, 1913.
[35] No. 280,959, Dec. 1, 1914.
[36] No. 250,920, Sept. 12, 1912.
[37] No. 255,680, Jan. 13, 1913; see also No. 266,618 (Part No. II).
[38] No. 254,371, Nov. 30, 1912.
[39] No. 249,868, July 30, 1912.
[40] No. 256,413, Feb. 10, 1913; supplement to No. 250,920.
[41] No. 248,178, June 13, 1912.
[42] No. 264,123, Sept. 8, 1913.
[43] No. 312,831, June 18, 1919.
[44] No. 254,672, Dec. 11, 1912.

Tensolite—Rubber Hydrochloride Stretched under Heat

H. D. Minich[1]

DESPITE rubber's versatility and multitudinous uses there are many purposes for which it is not suited in its usual state. In order to reach other consuming channels research has been directed toward chemically modifying the rubber hydrocarbon itself so as to impart new properties to the commodity. By reacting rubber with different reagents a number of these rubber derivatives have been prepared. One of these, rubber hydrochloride, has already shown promise of attaining great commercial importance and is presently being utilized in the form of thin sheet material as packages, raincoats, umbrellas, garments, etc. Recent processing improvements, which impart desired characteristics to the product for certain purposes and thereby extend its application further, will be discussed in this article.



Water-containing Bag Formed from Single-Ply Sheet Material about 0.0001-Inch Thick Held by the Author

Production and Properties of Rubber Hydrochloride

As early as 1900, Weber[2] prepared rubber hydrochloride by passing hydrogen chloride through a solution of rubber in chloroform and precipitating the reaction product with alcohol. Weber and subsequent workers used the results of their investigation chiefly as a means for studying the chemical composition of rubber. Patents[3] have been issued covering the utilization of rubber hydrochloride, particularly when used in thin sheet form. Not until recent years, however, did rubber hydrochloride begin to assume commercial importance, and the commercial product, known as Pliofilm, was introduced in 1934 by the Goodyear Tire & Rubber Co., Akron, O.

By reacting rubber $(C_5H_8)_n$ with hydrogen chloride a product of about 34% chlorine is theoretically obtainable having the formula $(C_5H_9Cl)_n$. To obtain the desired characteristics, however, the chlorine content is limited to between 28 and 30%. Compounds richer in chlorine content are brittle; while those poorer in chlorine content are tacky. One method of preparing rubber hydrochloride is to dissolve crepe rubber in benzene and react it with hydrogen chloride until the product has the required chlorine content. After the solvent and excess hydrochloric acid are removed the material is again dissolved. Added to the solution are coloring materials and an organic protective agent to prevent deterioration by the action of the sun's rays. The solution is spread as a film on a suitably surfaced moving belt, is dried, and then is continuously removed from the belt.

Sheets of properly prepared stable rubber hydrochloride are waterproof, burn very slowly, and resist the action of acids, oils, and greases. The compound becomes plastic and sticky at temperatures between 180 to 230° F. and will fuse under pressure within this temperature range. These films surpass those made from cellulose derivatives in extensibility, tear resistance, impact strength, resistance to puncturing and breaking, as well as in resistance to moisture, weak acids, oils, and greases.

Improved Rubber Hydrochloride—Tensolite

The writer has found that the physical properties of rubber hydrochloride may be fundamentally changed and given new characteristics by special treatment[4] of the sheet or film material. In this process, termed "tensilizing," the rubber hydrochloride sheet material is heated to 180 to 230° F. to make it plastic. In the plastic state the material is usually stretched from three to six times its original length and then cooled while in the stretched condition. The material which remains in the stretched state at room temperatures is known as Tensolite. As compared with the untreated material of the same gage, the sheet material obtained by this process has much greater tear resistance at right angles to the direction of stretch and, more important, has a materially greater tensile strength in the direction in which it was stretched. In the process the sheet acquired a spring-like resiliency. The unplasticized material acquires a crackly feel; while the plasticized material becomes extremely soft. The flame-resistant property of each type is measurably improved as the tensilized material retracts very rapidly in the presence of a flame.

The changes in properties brought about by this heat-stretch process indicate internal molecular rearrangement. Gehman, Field, and Dinsmore[5] have found that rubber hydrochloride has a crystalline X-ray structure. Stretched rubber hydrochloride, however, produced a fiber X-ray diagram indicating crystal orientation in the direction of stretch. This type of structure would account for the apparently grainlike structural properties of stretched rubber hydrochloride, as evidenced by increased strength in the direction of stretch and increased tear resistance at right angles to the direction of stretch.

The tensilized sheet material has been made commercially in thicknesses as low as 0.0003-inch and in the laboratory down to about 0.0001-inch; whereas the lower limit

[1] Consulting engineer, Philipse-Manor-on-Hudson, N. Y.
[2] *Ber.*, 33, 779 (1900).
[3] C. E. Bradley and J. McGavack, U. S. patent No. 1,519,659 (1924); W. C. Calvert, U. S. patent No. 1,989,632 (1935).
[4] British patent No. 497,788 (1936) and Canadian patent No. 378,040 (1938). United States patents pending with various claims already allowed.
[5] "Proceedings of the Rubber Technology Conference 1938." Paper No. 35, pp. 961-71.

of the untreated rubber hydrochloride film is about 0.0008-inch. Thus by the new process a given area of untreated sheet material can be converted into a larger area of the stretched material which has the superior characteristics noted above. The mechanism of the tensilizing process may be varied considerably to produce a wide variety of laminated tubular or threadlike products as indicated in a description of the process below.

Laminated Films

In making a laminated Tensolite film having, for example, two narrow colored strips on a transparent background, one or more wide transparent strips and two narrow colored strips are fed from rolls of untreated material through an assembly pattern, which has slots for guiding the various strips into their proper position in relation to each other. The assembled strip is then passed through a suitable guide, over a heated cylinder, through a cooling compartment, stretching rollers, and then on to a takeup reel. The sequence of these operations may be varied and the threading of the machine modified to give the desired characteristics to the product. The stretching rollers are driven at a higher speed than the feeding rollers; while the heating cylinder is mounted to roll freely. Thus as the assembled strip passes over the surface of the heating cylinder, it is heated to the plastic state, and the higher speed of the stretching rollers elongates the plastic laminations and causes them to fuse into a homogeneous strip, the thickness of which is only a fraction of that of the assembled unstretched strip.

The characteristics of the laminated product may be modified by varying the stretch, heat, and method of cooling, by using a grained or ribbed surface on the heating roller, or by modifying the shape of the assembly pattern slots. By narrowing the slots in the assembly pattern the edges of the passing strips are folded so that the final material has beads or rib-like formations. By repeating the stretching process in varying ratios and temperatures, the material may be given modified characteristics such as increased strength, more or less elasticity, richer luster, and increased crinkliness. Also by means of a secondary tensilizing treatment several pretreated sheets assembled with crosswise grain directions will produce a sheet material with a more uniform tensile strength in all directions.

Printing or perforating one or more of the intermediate layers will produce ornamental designs. Special ribbed effects may be produced by using twisted narrow strips between the laminations. Still other products are obtained by laminating layers of treated rubber hydrochloride with layers of untreated material.

Single-ply or laminated sheet material may also be stretched longitudinally and transversely to produce materials that have uniform and increased tensile strength in all directions. These products also have much greater flexibility than cross-laminated material made from pretensilized sheets.

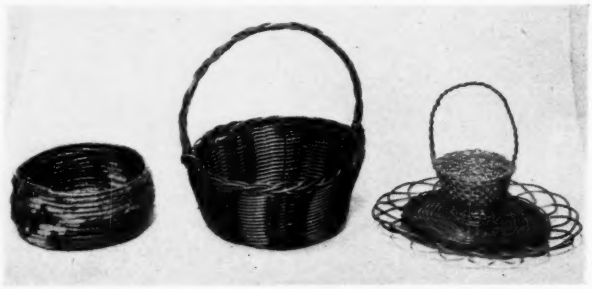
Thread- and Tube-Like Products

By rolling narrow strips of the material back and forth over a heated surface while stretching, threads and cords may be obtained. They may be tapered (short lengths), tubular, elastic, inelastic, or filled with textile fibers, cellulose derivatives, abrasives, vinyl polymers, rubber, wire, etc. They may be made round, oval, square, flat, smooth, or rough. Yarns for weaving and braiding are made in many forms: crushed, twisted, rolled, laminated, etc.

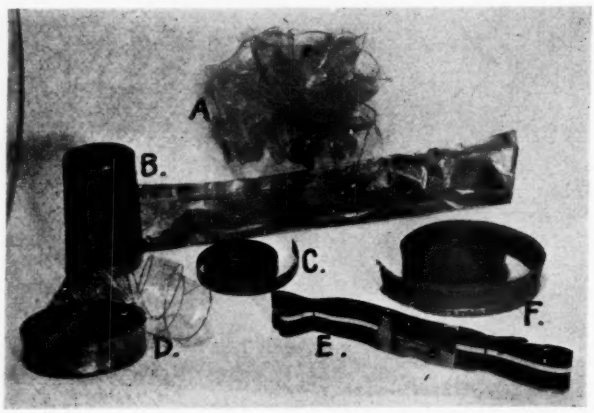
The illustrations shown are not intended to cover all the possible applications of Tensolite, but are merely suggestive of a few of the possible applications.

Commercial Status

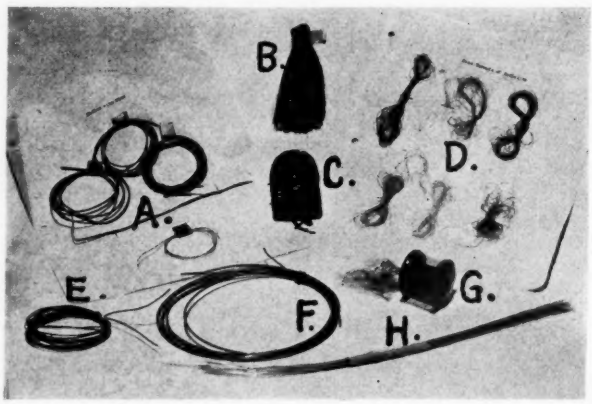
As previously indicated, British and Canadian patents covering the process have been issued. Applications for United States patents have been filed. Pending issuance



Basketry Made from Rod-like Tensolite Which Requires no Soaking as in the Case of Ordinary Basket Reeds

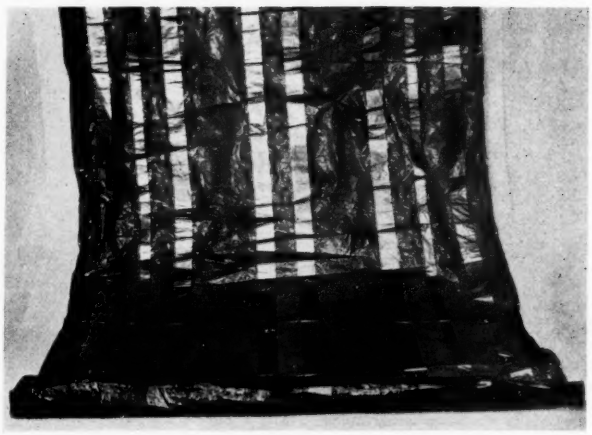


***A*, Artificial Flower Made from Tensolite Material Known as Florafilm with Stamens Made from Bristles Having the Ends Curled by Heat; *B*, Roll of Laminated Wide Ribbon; *C*, Narrow Belting Material; *D*, Transparent Ribbon with Beaded Edge; *E*, Laminated Belt; *F*, Crinkled Ribbon**

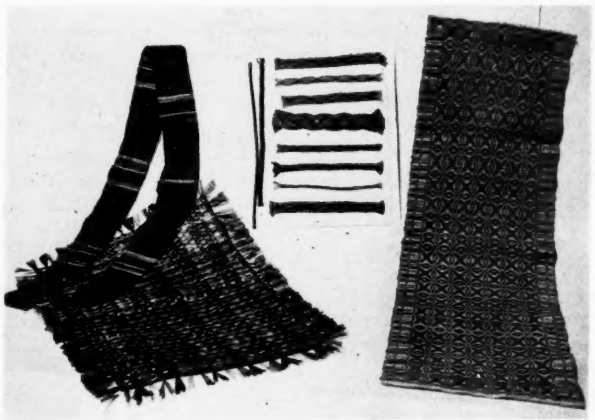


A*, Insulated Wire; *B*, Tassel; *C*, Ball of Crushed Tape for Weaving and Crocheting; *D*, Fine Threads; *E*, Fish Line; *F*, Tennis String (Guttarubba); *H*, Bristles; *G*, Package of Fine Thread Wrapped by Stokes-Smith Stretch-Wrap Machine

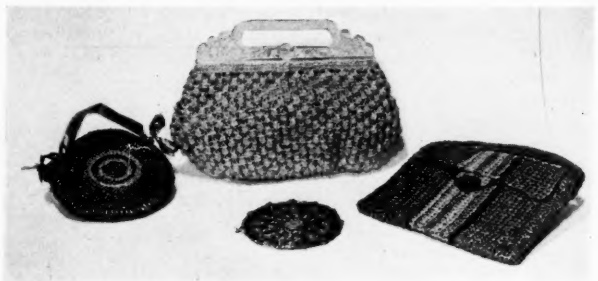
*See India Rubber World, Feb., 1940, p. 58 for description of this machine.



Laminated Striped Sheet, 24 Inches Wide and 0.003- to 0.006-Inch Gage



Center, Machine Braided Forms; *Left and Right*, Hand-Woven Materials



Crocheted and Knitted Bags

of the latter, the writer made an arrangement with the Goodyear Tire & Rubber Co. whereby it has the exclusive rights to use his process in producing rubber hydrochloride products. By further arrangement with Goodyear the writer may manufacture and sell certain tensilized rubber hydrochloride products. Goodyear has extended the trade name Pliofilm to cover both tensilized and normal material. Many of the products and forms suggested in this article have only been produced experimentally, but some are already in commercial production. The process, as patented, also covers materials such as the other hydrohalogenated derivatives and the halogenated derivatives of rubber and related materials.

Testing Elastic Thread

(*Continued from page 47*)

the covered elastic yarn to weave, knit, or braid into various types of fabric. If the rubber thread lacks uniformity, the elastic yarn made from it will likewise be uneven. This may cause defects to show up in the finished product in the form of puckers or waviness, as well as contributing to manufacturing difficulties of greater or less degree all along the line.

In this ever-present problem of production control for uniformity a regular testing routine plays an important part. Specimens from each unit of production are examined, and production is held to a strict standard of uniformity. Figure 2 shows the initial stretch and recovery lines for three specimens taken from a skein at random. Figure 3 shows a similar test on another type of thread.

Covered vs. Uncovered Thread

Another important factor which must be kept continually in mind in producing rubber thread is that the consuming manufacturer of elastic yarn may cover this naked thread in any one of numerous ways. In meeting the special requirements of customers the thread manufacturer must look beyond the rubber thread and study the covering to be used because the type of covering will affect the elastic action of the finished product. One basic consideration is that rubber thread is always elongated in the process of being covered. For this reason test curves on covered elastic yarn differ from curves on naked thread, depending upon the nature of the covering. Comparison of the curves in Figures 4 and 5 and those in Figures 6 and 7 shows the difference in behavior between naked thread and the same thread after being made into elastic yarn covered with a double helically opposed wind of cotton yarn.

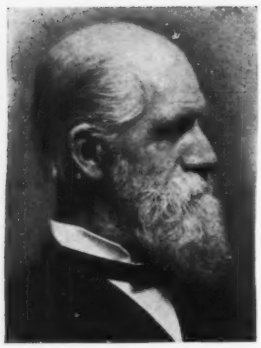
The incline-plane machine has demonstrated the value of graphic recording of tests in manufacturing routine, both in formulating the desired types of thread through comparative experimentation and study and in producing these particular threads with consistent uniformity.

Rubber and Synthetic Resins

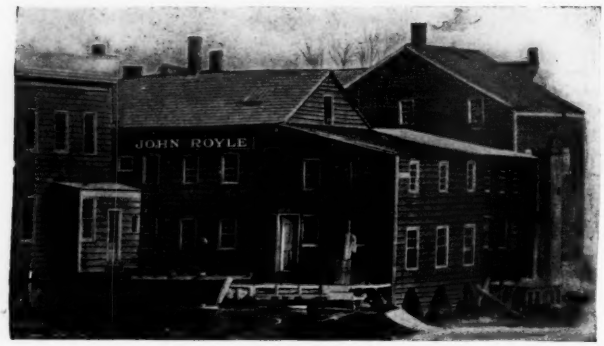
A recent paper[1] on "Synthetic Resins in the Rubber Industry" by R. G. R. Bacon and P. Schidrowitz describes investigations in which typical polyvinyl resins (polyacrylic methyl ester, polyacrylic nitrile, polymethacrylic methyl ester, and polystyrene) were added to rubber by mixing the polymer latex with rubber latex and coagulating. Test results on soft rubber compositions with small quantities of resins showed no interference with compounding and vulcanization, or with the rubber-like characteristics of the vulcanizates. But the advantages of the resin incorporation did not appear great. It seemed that if useful properties of the polymer, such as solvent- and abrasion-resistance, were to be transferred to the mixed compositions, they would be acquired only in proportion to the amount of polymer incorporated and that big improvements in such directions could only be brought about by adding large amounts of the selected polymer. However, this would probably lead to a serious lowering of rubber-like properties. A general effect of addition of the polymers examined was a stiffening of the vulcanizates.

[1] *Trans. Inst. Rubber Ind.*, Oct., 1939, pp. 152-71.

Builders of Royle Extruders Celebrate Eighty-fifth Birthday



John Royle, Sr., Founder



Royle Machine Shop—1860

THIS year, 1940, marks the eighty-fifth anniversary of the founding of John Royle & Sons, Paterson, N. J., which for 60 years has been identified with the development of the tubing machine. Headed by men of exceptional mechanical and engineering ability, men of prolific inventive genius, the firm has steadily progressed in its service since its inception in 1855.

Early Company History

The founder of the company, John Royle, Sr., who was born in England, in 1822, came to America with his parents in 1830. The family settled in Paterson, the present home of the firm. John received little schooling and, when 10 years old, went to work in a cotton mill. Six years later, in 1838, he left and became employed by the Rogers Locomotive Works, as a machinist's apprentice. After serving here for some time and in other positions requiring mechanical skill, he decided to go into business for himself.

In 1855, Mr. Royle opened a small machine shop in Paterson, doing work for local textile mills. In this field the firm developed machines for cutting, lacing, and repeating Jacquard card. Later he built machinery for the graphic arts—equipment for wood engraving at first and then for brass and photo engraving as these developments came about. The firm is still identified with these two early enterprises. In its formative years before the Civil War, the firm had to struggle for its existence, but by 1863 it had become definitely established. Mr. Royle's younger son, John, Jr., entered the machine shop in 1868; while the elder son, Vernon, joined the firm in 1879.

Development of the Royle Tuber

The year 1880 was an important one for the Royle family. It was then that a partnership was formed by the elder Royle and his two sons under the name of John Royle & Sons, which name continues up to the present. Sixty years ago the Royle machine shop was not much to boast of; John, Sr., and John, Jr., comprised the entire shop force; while Vernon was draftsman, salesman, and office clerk. Principal business at that time was jobbing for the local mills. Work was scarce, and the firm was looking for something to manufacture. It was in 1880 that the Royles hit upon the idea of making a machine to form rubber into a seamless tube by forcing it through a die under screw pressure.

The first Royle tuber followed the lines of a crude experimental machine already in existence. However the introduction of the new machine marked a distinct advance. It was considered to be the first tubing machine of real practical value. Building a tubing machine in those days was not without difficulty. The Royles had never been inside a rubber factory, and as a matter of fact, they built and sold tubing machines for twenty years without once seeing one in operation. Rubber factory operations were a closely guarded secret, and no strangers were admitted.

The first Royle tuber was not patented; fees for patents looked formidable in those days. When the commercial future of the machine was assured, subsequent developments were protected by adequate patents. The basic principle of the Royle tuber of today is the same as in the first one built in 1880, but refinements in design and structural improvements have been many.

In the early days operating speeds of ten to twelve turns per minute were used. Stock screws and gears were made of cast iron. The first thrust bearing was merely a steel screw with a hardened point which bore against a depression in the butt end of the stock screw. When the Royle tuber found definite acceptance, changes were quickly made. The open jacket cylinder was abandoned in favor of a spirally cored cylinder. Originally located directly on top of the machine, the feed throat was placed at an angle. The original thrust bearing was replaced by three friction washers and an oil-soaked fiber washer to receive the thrust. A steam chest with valves was added to control circulation of steam and water to head and cylinder.

Until 1905 tubing machines were belt-operated with variations in speed obtained by a stepped cone pulley. The introduction of electric motors with higher speeds made necessary the use of an intermediate gear. Before the present flexibility in motor speed control, a gear shift unit was used. Worm-and-gear drives for Royle machines date from 1923; while more recent developments have led to the use of helical and herringbone gears.

Aside from the mechanical refinements in design a number of features have been developed to extend the application of the tuber. The soapstone injecting head for dusting the interior of thin-walled tubing was introduced in 1891; while a special soapstone head and die fixtures for inner tubes were brought out in 1917. The side delivery head for insulating wire was designed in 1890, and a self-centering head for this application was introduced in 1930. In 1902 Royle began making strainer plates for use in tubing machine heads. Steel plates with fine holes, $\frac{1}{16}$-inch diameter, were first used. Later the holes were made larger and a screen of wire cloth interposed. The gate-type expansion head for straining, which was patented in 1929, was a major step forward in design.

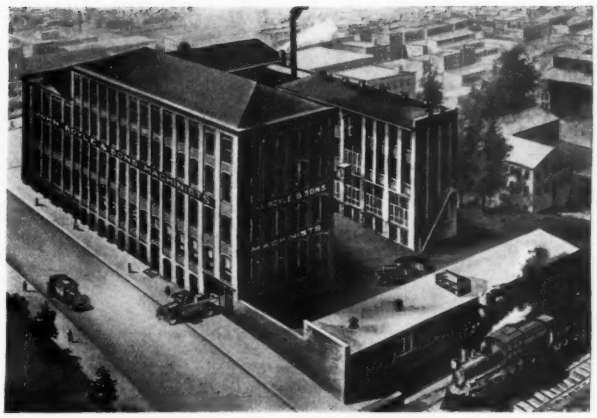
Circular Loom

Another development identified with Royle is the circular loom for weaving seamless fabric coverings for steam, fire, and garden hose. This machine was introduced in the early part of the twentieth century as the Royle-de Laski loom. From this early machine has grown the present Royle circular loom, involving important modifications of the original model.

Present Company Structure

John Royle, Sr., retired from active supervision of the company in 1887, leaving affairs in the hands of his two sons. In 1898 the partnership was dissolved, and the present firm was incorporated under the laws of New Jersey. Both sons continued active in the business until their deaths: John, Jr., in 1922 and Vernon in 1934. Vernon E. Royle, son of Vernon and grandson of the founder, took over the presidency of the company in 1934.

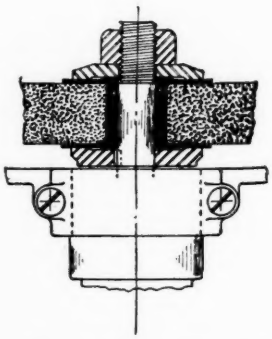
A new step in Royle management came in January, 1939, when Clifford H. Ramsey, cousin of Vernon E. Royle, who had served the company for 17 years in his early life, returned as general manager upon the insistence of Mr. Royle. Mr. Ramsey, retired machinery manufacturer, purchased stock in the company, and at a meeting of the board in January, 1940, was elected treasurer. His son, Justin H. Ramsey, who has contributed to the firm's progress in the plastics machinery field, was elected vice president at the same time. Vernon E. Royle continues as president, and Robert H. Kelley as secretary. Thomas C. Malcolm is newly elected as assistant treasurer. New plant superintendent is Charles J. Vollmer, connected with the company for 16 years.



Present-Day Royle Plant

Vibration Dampener Bushing for Hand Grinders[1]

Paul L. Kuznick[2]



Cross-Sectional View of Abrasive Wheel Assembly, Showing Rubber Vibration Dampener Bushing in Solid Black

THE vibration dampener bushing discussed here is intended for mounting straight abrasive wheels, six and eight inches in diameter, on electric, pneumatic, and flexible-shaft portable grinders. In recent years all types of portable grinders have been greatly improved in power and in other points of efficiency. Such machines held freely in the hand cannot possibly operate so smoothly as machines of greater weight or as they would if fixed rigidly in position. The vibration, inherent in these small powerful grinders, results in decreased wheel efficiency, increased machine wear, and often in unsatisfactory work.

It was known that various schemes involving resilient mountings had been tried without satisfactory results, but it appeared that with proper engineering methods and appropriate tests there was an opportunity for improving the operation of the wheels on this type of grinder. From the tests conducted, it was evident that, in order to dampen vibration effectively, proper coordination of the following factors must be achieved: quantity of insulation, weight of the rotating wheel, and speed of operation.

The present vibration dampener bushing was the result of this research. The bushing is made in two halves, each of which contains three integrated elements: namely, a bushing portion which covers the shaft and fits snugly into the hole of the wheel; a flange that is only slightly larger in diameter than the metal flanges of the machine; and a bushing bead located underneath the flange and immediately surrounding the spindle. A bushing half, embodying these three features, is inserted in each side of the wheel opening. When the spindle nut is tightened, the flanges are drawn up and the bead is compressed, causing the inner bushing portion to form a more intimate contact with the spindle and the hole in the wheel. The flange portions of the vibration dampening bushing are compressed tightly against the sides of the wheel by the peripheral bearing faces of the metal flanges to give a positive driving action. When tightened, the abrasive wheel is properly centered, and there is not sufficient play in the rubber mounting to permit the rotating wheel to be forced off center while in operation.

Results obtained during operation of a portable grinder equipped with the new vibration dampener bushing definitely prove several points of advantage. The velvety action produced eliminates fatigue to the operator and enables him to guide the wheel with greater accuracy, thus assuring a smoother surface on the material being ground. The amount of work that a wheel will accomplish is greatly increased; while the wear on the machine is measurably reduced, resulting in lower maintenance cost. In its present form the vibration dampener bushing is not applicable to cup-shaped abrasive wheels. Besides it will not produce the same degree of improvement when used on wheels of large size, mounted rigidly with the machine and turning at lower speeds.

[1] U. S. Patent No. 2,187,350.

[2] Superintendent, Abrasive Wheel Dept., Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc., Passaic, N. J.

Vulcanization of Rubber—II[1]

Harry L. Fisher[2]

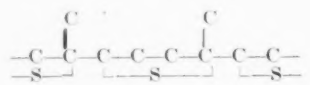
THE following article concludes the interesting and informative treatise on vulcanizing rubber, begun in our March issue.

Theories of Sulphur Vulcanization

This subject has been so well and completely treated by Kindscher,[3] van Rossem,[4] and Williams[5] that only a few outstanding facts and their significance will be presented.

Vulcanization is accompanied by the chemical combination of sulphur with the rubber hydrocarbon. The reaction is considered to be irreversible since every attempt to remove the sulphur has resulted in the disruption of the rubber molecule. The rate of addition is constant and independent of the proportion of sulphur present, even when the amount is small and all of it is in solution. It is a true chemical reaction since the temperature coefficient lies within limits assumed for chemical reactions. It is believed that the sulphur in some way saturates double bonds, since the proportion of double bonds is diminished by an amount equal to that calculated on the basis of one double bond for each atomic equivalent of combined sulphur. The fact that hydrogenated rubber, which is a saturated compound, cannot be vulcanized[6] is evidence that the double bonds play some part in the vulcanization reaction.

The type of chemical combination is not known, and practically none of the types proposed have experimental work to substantiate them. Since sulphur chloride reacts with simple olefins uniting two molecules with a sulphur bridge, it has been postulated by many authors that sulphur forms bridges between molecules of rubber. The reaction of sulphur vulcanizates with methyl iodide indicates that part of the combined sulphur is in the form of thioether linkages, R—S—R,[7] but serious doubt has recently been cast on this conclusion by Brown and Hauser,[8] and Williams,[9] and Smallwood[10] concludes that it is wholly unwarranted. A thiophene linkage has also been proposed,



from the types of thiophenes found by destructive distillation of ebonite.[11]

Decrease in solubility is associated with increase in molecular weight in large molecules, and therefore polymerization has been considered as taking place in vulcanization. Sulphur and benzoyl peroxides are polymerizing agents, and both vulcanize rubber. Polymerization means loss of some unsaturation, and no loss other than that accounted for by combined sulphur can be detected, since it would be too small to be estimated by present chemical methods. Polymerization should mean a decrease in volume, but high pressures have been found to give no change in volume or in properties, even when the rubber is swollen with isoprene.[5] Under very high hydraulic pressure and high shearing stress Bridgman[12] found that rubber is converted into a hard, translucent hornlike material. Isoprene alone under high pressures polymerizes to produce a vulcanized type of rubber.

It has been postulated that a small portion of the rubber becomes completely saturated with sulphur and that this polyprene sulphide is then dispersed in the raw rubber and thus forms the vulcanizate. Experiments to prove this have all failed.

Until recently all the evidence showed that the rubber-sulphur products were homogeneous, and every effort to fractionate vulcanized rubber failed to show any difference.[13] Using purified rubber partially vulcanized to a sulphur content of only 0.06%, Midgley, Henne, Shepard, and Renoll[14] obtained three fractions by fractional precipitation; the second and third fractions had two and three times the sulphur content of the first. Williams[9] peptized several samples of well-vulcanized rubber, with the usual proportion of combined sulphur, by means of piperidine in toluene and fractionally precipitated them with ethyl alcohol. These fractions had fairly wide variations in their sulphur content. He concluded that "no direct evidence exists to support the sulphide theory of vulcanization."

The formation of polar groups on the rubber molecule is said to be essential to produce vulcanization. Natural crude rubber is a non-polar material, and vulcanization increases the polarity of the rubber.[15] Since vulcanization with Grignard reagents gives a complex which probably contains polar groups, this theory is given some support.[16]

Boggs and Blake[17] assume that there are two types of unsaturation in rubber; that the saturation of one type (the end double bonds) gives soft rubber, and that of the other type (the remaining double bonds), hard rubber, and that both reactions go on at the same time. They base their theory chiefly on the amount of heat produced in the reactions.

From his study of methods to determine the extent of vulcanization, Garvey[18] concluded that during vulcanization there are at least two reactions—a combination of the agent with rubber, and an unknown reaction of the rubber hydrocarbon catalyzed by the vulcanizing agent.

New Hydrogen Sulphide Theory

Let us return now to the application of the generalization obtained from the study of the action of non-sulphur vulcanizing agents to sulphur vulcanization and the theory developed from it. The hydrogen sulphide theory proposes that:

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[1] Paper presented before the Division of Rubber Chemistry at the ninety-eighth meeting of the American Chemical Society, Boston, Mass., Sept. 11 to 15, 1939. Abstracted from *Ind. Eng. Chem.*, Nov., 1939, pp. 1381-89.

[2] U. S. Industrial Alcohol Co., Stamford, Conn.

[3] Chapter on "Vulcanization of Rubber," in Memmler's "Science of Rubber," translated by Dunbrook and Morris, p. 270, Reinhold Pub. Corp., New York, 1934.

[4] *India Rubber J.*, 92, 845 (1936).

[5] Chap. 6, p. 237, "Chemistry and Technology of Rubber," Davis and Blake, A. C. S. Monograph 74, Reinhold Pub. Corp., New York, 1937.

[6] Staudinger and Fritschi, *Helv. Chim. Acta*, 5, 785 (1922).

[7] Meyer and Hohenemser, *Ibid.*, 18, 1061 (1935); *Rubber Chem. Tech.*, 9, 201 (1936).

[8] *Ind. Eng. Chem.*, 30, 1291 (1938).

[9] "Proc. Rubber Tech. Conf.," London, 304 (1938); *Rubber Chem. Tech.*, 12, 191 (1939).

[10] H. M. Smallwood, personal communication.

[11] Midgley, Henne, and Shepard, *J. Am. Chem. Soc.*, 56, 1326 (1934).

[12] *Phys. Rev.*, 48, 825 (1935).

[13] Bacon, *J. Phys. Chem.*, 32, 801 (1928); *Rubber Chem. Tech.*, 2, 138 (1929).

[14] *J. Am. Chem. Soc.*, 56, 1325 (1934).

[15] Tanaka, Kambara, and Hirakawa, *J. Soc. Chem. Ind. (Japan)*, 40, 263 (1937); *Rubber Chem. Tech.*, 10, 708 (1937).

[16] Midgley, Henne, and Shepard, *J. Am. Chem. Soc.*, 56, 1156 (1934).

[17] *J. Ind. Eng. Chem.*, 22, 748 (1930).

[18] *Ind. Eng. Chem.*, 26, 437 (1934); Garvey and Thompson, *Ibid.*, 25, 1292 (1933).

Hydrogen sulphide, which is formed by the action of sulphur with the non-rubber constituents or the rubber hydrocarbon itself, adds to a double bond in a molecule of rubber hydrocarbon forming a mercaptan.

The rubber mercaptan is then oxidized by sulphur to form a disulphide, and hydrogen sulphide is generated as a by-product of the reaction. If the mercaptan groups which are oxidized are in the same molecule, then the disulphide structure will unite two portions of the same molecule, and if they are in different molecules, the disulphide structure will form a bridge connecting two molecules.

The hydrogen sulphide generated as a by-product may react with another double bond and thus continue the reaction.

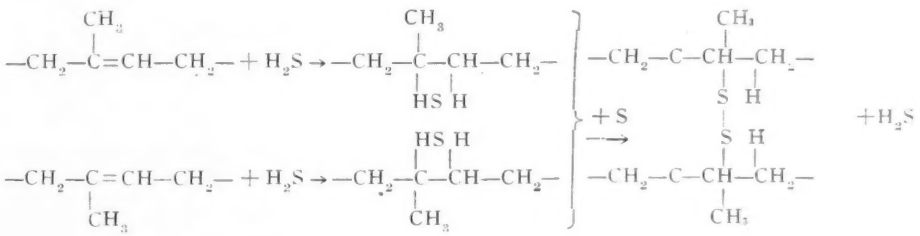
Sulphur may catalyze the addition of hydrogen sulphide to a double bond.

The reaction may be a chain reaction, and then there would be only a small amount of hydrogen sulphide left over at the end.

Organic accelerators may act in two ways: (*a*) to catalyze the addition of hydrogen sulphide to a double bond and possibly also to catalyze the oxidizing action of the sulphur, and (*b*) in many cases to give hydrogen sulphide by reaction with sulphur.

Inorganic accelerators may act as they are or, in the form of the corresponding sulphides, like organic accelerators, except that they cannot readily help to supply hydrogen sulphide.

An organic chemist's idea of such a reaction can be illustrated with two sections of rubber structure as follows:



Arguments for the Theory. The theory postulates that there should be a loss of one double bond for each atomic equivalent of sulphur chemically combined. This is in accord with the facts.

The Peachey process of vulcanization with hydrogen sulphide and sulphur dioxide[19] is easily explained by the theory. The sulphur required for the oxidation could be supplied by the interaction of the two gases. Also, sulphur dioxide is an oxidizing agent and could oxidize the —SH groups. This statement is given support by the work of Hock and Schmidt,[20] who show that it is the rubber which causes reaction between the two gases and emphasizes the fact that the vulcanizing reaction begins even with dry rubber. No reaction occurs in the absence of rubber between the two gases at room temperature when they are dry.

That hydrogen sulphide is present during vulcanization is shown by the odor of the gas during the heating of a rubber-sulphur mix, especially when the press is opened, and also by the fact that certain metallic oxides such as zinc oxide, ferric oxide, and litharge are converted into the corresponding sulphides. These oxides are not converted into the sulphides by elemental sulphur at the temperatures used.

If hydrogen sulphide adds to rubber in the preliminary stages of vulcanization, then vulcanization should proceed more rapidly and show a greater proportion of combined sulphur in an atmosphere of hydrogen sulphide than in air. Buizov and Popova[21] studied the "influence of the gaseous medium on hot vulcanization" and found that vulcanization does proceed more rapidly in hydrogen sulphide than in air, and still more rapidly when the hydrogen sulphide is mixed with steam. No analyses of combined sulphur were reported. Sulphur dioxide showed the least influence of all the gases studied; in fact it showed a retarding influence. It is of interest that ammonia was close to hydrogen sulphide. The compound used consisted of rubber 93, sulphur 6.5, and magnesium carbonate 0.4 and was heated for 60 to 120 minutes at 135-138° C. Some of the results are given in the following table:

Gas	% Free Sulphur	
	60 Min.	120 Min.
Sulphur dioxide	5.63	5.06
Air	5.44	4.86
Vacuum	5.20	4.09
Ammonia	4.58	3.50
Ammonia and steam	4.54	2.86
Hydrogen sulphide	4.32	2.96
Hydrogen sulphide and steam	4.05	2.27

The method of sulphurizing olefin bonds with sulphur in the presence of hydrogen sulphide, including the vulcanization of rubber, was patented by Alexander and Posnansky.[22] Ammonia, amines, and accelerators are used as sulphur carriers.

Vulcanization of a rubber-sulphur mix *in vacuo* should not be so good as when it takes place at or above atmospheric pressure, on account of the loss of hydrogen sulphide. This was found to be the case of Zhavaronok[23] although his explanation is different.

The evidence for the addition of hydrogen sulphide to double bonds is very recent, little being available when the theory was first proposed. Usually and probably always catalysts are necessary, including sulphuric acid, ammonia and amines, peroxides, metal sulphides, and especially sulphur, and sometimes temperatures as high as 200-300° C.[24] Jones [25], working with E. E. Reid, gave some interesting results on the addition of hydrogen sulphide and mercaptans to propylene, and Böeseken and Linde[26] found that there is a reaction between hydrogen sulphide and isoprene only when a catalyst such as ferrous sulphide is present, and then both mono-and dihydrogen sulphide addition products are formed at temperatures up to 100° C. Meyer and Hohenemser[7] treated cyclohexene with sulphur at 150° C. and obtained cyclohexyl mercaptan and dicyclohexyl sulphide, but no cyclohexenyl mercaptan and no cyclohexenyl sulphide. Their results can readily be explained by the formation at first of hydrogen sulphide and the addition of it to the double bonds.

The addition of mercaptans to double bonds was de-

[19] Peachey and Skipsey, *J. Soc. Chem. Ind.*, 40, 5T (1921).
[20] Hock and Schmidt, *Kautschuk*, 10, 82 (1934); *Rubber Chem. Tech.*, 7, 637 (1934).
[21] Buizov and Popova, *J. Gen. Chem. (U. S. S. R.)*, 4, 6, 889 (1934); *Rubber Chem. Tech.*, 8, 437 (1935).
[22] French patent No. 787,810 (1935); British patent No. 453,921 (1936); Canadian patent No. 374,825 (1938).
[23] Zhavaronok, *J. Applied Chem. (U. S. S. R.)*, 9, 1290 (1936); *Chimie & industrie*, 37, 742 (1936).
[24] Barr and Keyes, *Ind. Eng. Chem.*, 26, 1111 (1934); Carter and Downing, U. S. patent No. 2,061,019 (1936); Duffey, Snow, and Keyes, *Ind. Eng. Chem.*, 26, 91 (1934); Johansen, U. S. patent Nos. 1,836,170-171 (1931); Keyssner, U. S. patent No. 2,163,176 (1939); Nisson and Mandelbaum, U. S. patent No. 1,836,183 (1931).
[25] S. O. Jones, dissertation, Johns Hopkins Univ., 1936.
[26] *Rec. trav. chim.*, 54, 739 (1935).

scribed in 1905 by Posner.[27] In this connection mention is made of the addition of thioglycolic acid, $HS.CH_2COOH$, to rubber.[28] The addition product is soluble in aqueous alkali, and therefore it would appear that the mercapto group adds to the double bond and the carboxyl group is free. Thioglycolic acid does not vulcanize rubber even in the presence of an oxidizing agent.

ARGUMENTS AGAINST THE THEORY. The theory requires a disulphide structure, and there is no experimental proof for such a structure.

No addition product of rubber and hydrogen sulphide has been isolated. Efforts of the author to prepare a rubber mercaptan were fruitless.

If the hydrogen of the added hydrogen sulphide comes from the rubber hydrocarbon, then the hydrogen content of the vulcanizate will be the same as when it is assumed that only elemental sulphur is added. If it comes entirely from non-rubber constituents, then the vulcanizate will contain extra hydrogen. The actual amount of this extra hydrogen will be small and not easily determined, but if enough hydrogen can be obtained from outside sources and enough sulphur is present to form hard rubber, then the differences can easily be determined. No determinations of carbon and hydrogen could be found in the literature; therefore Fisher and Schubert[29] performed some experiments, with the result that no extra hydrogen was found.

Assuming the minimum number of isopentene units in the rubber molecule to be 100, the formula of the rubber hydrocarbon would be $C_{500}H_{800}$, and the formula for a vulcanized rubber containing about 4.5% of combined sulphur would be $C_{500}H_{800}S_{10}$. The corresponding vulcanized molecule formed through the initial addition of hydrogen sulphide would be $C_{500}H_{810}S_{10}$. The composition of these last two would be as follows:

	$C_{500}H_{800}S_{10}$	$C_{500}H_{810}S_{10}$	Difference
C	84.186	84.068	—0.118
H	11.315	11.439	+0.124
S	4.499	4.493	—0.006
Total	100.000	100.000	

These figures show that it would be difficult to distinguish between two such compounds by analysis. However, if the same reaction continued until every double bond is saturated—in other words, until hard rubber is formed—then the formula for the final product would be $(C_5H_8S)_x$, or on the same molecular basis as above, $C_{500}H_{900}S_{100}$. The corresponding present-day accepted formula is $(C_5H_8S)_8$ or, again using the same molecular basis, $C_{500}H_{800}S_{100}$. The composition of these last two would be as follows:

	$C_{500}H_{800}S_{100}$	$C_{500}H_{900}S_{100}$	Difference
C	59.923	59.326	—0.597
H	8.054	8.970	+0.916
S	32.023	31.704	—0.319
Total	100.000	100.000	

Remarks

In the formation of soft rubber, the rate of the addition of sulphur is constant, regardless of the proportion of sulphur present. Perhaps the combination of the reactions outlined in the new theory will explain the formation of the straight-line curve obtained when the reaction rate is plotted.

Perhaps also the theory explains Garvey's second postulation in his attempt to outline the course of vulcanization—namely that there is a reaction of the double bonds of the hydrocarbon which does not involve sulphur.

[27] *Ber.*, 38, 646 (1905).
[28] Holmberg, *Ber.*, 65, 1349 (1932); *Rubber Chem. Tech.*, 6, 71 (1933).
[29] *Ind. Eng. Chem.*, 28, 209 (1936).
[30] *Ind. Eng. Chem.*, 14, 25 (1922).

The vulcanization at room temperature of rubber mixtures containing sulphur, tetramethylthiuram disulphide, and zinc oxide, which have been exposed to hydrogen sulphide, was explained by Bedford and Sebrell[30] by their polysulphide theory. It may be that the new theory will explain this reaction more satisfactorily.

Dibenzyl disulphide does not vulcanize rubber, either alone or in the presence of an oxidizing agent, whereas thiophenols, which are derivatives of hydrogen sulphide, do vulcanize rubber in the presence of oxidizing agents. This is especially interesting since thiophenols readily form disulphides outside of rubber in the presence of mild oxidizing agents.

Since hydrogen sulphide and water have some properties in common, can water be chemically combined with the rubber hydrocarbon and the resulting product be oxidized to form a vulcanizate? In other words, can rubber be vulcanized with water and an oxidizing agent? Several experiments were tried, but none were successful.

On the basis of the hydrogen sulphide theory the author predicted that phenols and thiophenols would vulcanize rubber in the presence of oxidizing agents, and experiments bore out this prediction.

In this world of today it is believed that work with the non-sulphur vulcanizing agents is laying the foundation which in the world of tomorrow will furnish the key to the solution of the baffling problem of the chemistry of rubber vulcanization.

Acknowledgment

The new work described in this paper was carried out while the author was with the United States Rubber Co. He is deeply appreciative of the assistance and fine cooperation of his associates, M. C. Fernald and S. D. Shinkle, and extends his thanks to W. A. Gibbons, director of development, for permission to publish the experimental findings. He is also grateful to Robert W. Eldridge for his constructive criticisms.

Rules for 1940 New York Group Prize Essay Contest

Rules for submission of papers in the 1940 prize essay contest, conducted by the New York Group, Rubber Division, A. C. S., follow: (1) contestants must be under 35 years of age and be paid-up group members (annual dues, $1); (2) papers should be of a technical nature, relating to rubber or synthetic rubber, and may be the result of original work, development results, or interpretive results of literature; (3) papers must be submitted in triplicate, with the author's name omitted, but with author's name and address attached separately to each copy; each paper will be coded so that judges cannot identify the author; all entries must be typewritten on 8½- by 11-inch paper, double spaced; in general papers should conform in style to papers published in *Industrial & Engineering Chemistry* (abstract, purpose, body, summary, and bibliography), but this form need not be followed exactly; (4) papers submitted will become the property of the group, and their publication in the trade press will be at the discretion and selection of the contest committee; (5) the three papers deemed best in the committee's judgment will receive awards totaling at least $100; (6) all entries must be received by September 5, 1940, and sent to C. R. Haynes, chairman, c/o Binney & Smith Co., 41 E. 42nd St., New York, N. Y.





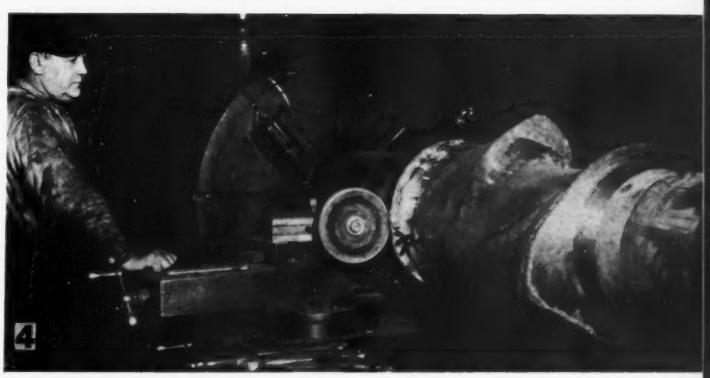
Welding Service for the Renewal of Banbury Parts

VITAL in many rubber manufacturing plants is the Banbury mixer. Failure of the Banbury through wear or breakage may result in costly and lengthy interruptions in production. With this condition in view the Interstate Welding Service, Akron, O., was instituted seven years ago with a twofold purpose: (1) to repair broken parts quickly, and (2) to provide a precautionary inspection service to enable necessary rebuilding of the machine before failure occurs. In the latter instance the rebuilding can be accomplished at slack periods when requirements are light.

The complete Banbury rebuilding service includes replacement of bearings, dust stop rings made of brass, bolts, oil tubes, etc.; while the parts rebuilt are rotors, sidewalls, end frames, gears, door top, and end frame rings. The process, as illustrated, consists essentially of cleaning worn areas and adding new metal by arc welding methods, utilizing a material with high abrasion resistance to assure long wearing qualities of the new surfaces. In applying new metal care is taken to avoid undue stresses in the base material that would cause warpage of the processed part. The rebuilt areas are then machined or ground down to original dimensions and the desired finish, observing close tolerances throughout. Clearances between rotors and sidewalls may be held as low as $\frac{1}{16}$-inch if desired.

Banburys up to the No. 27 size can be completely rebuilt in three weeks' time, it is claimed; while minor repairs can be handled in a shorter period. The firm recently acquired an airplane to provide rapid consultation service on Banbury problems of this type.





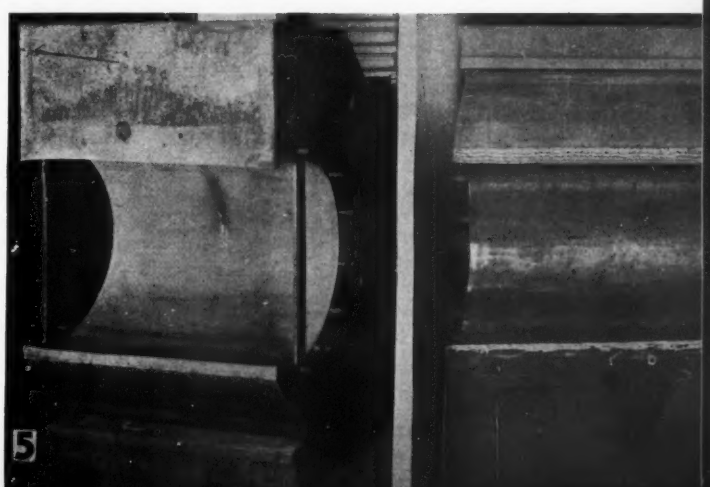


Fig. 1. Set of Cracked and Worn Rotors Prior to Rebuilding

Fig. 2. Renewing Worn Area of Rotor by Arc Welding Process

Fig. 3. Rotors after Welding, but before Machining and Finishing

Fig. 4. Grinding Built-up Journal Area of Rotor

Fig. 5. Cracked and Worn Banbury Sidewall before *(Left)* and after *(Right)* Rebuilding

EDITORIALS

Distribution and Growth of Industrial Research

ACCORDING to a recent report resulting from the National Research Program established in 1935 under the supervision of Corrington Gill, assistant administrator of the Works Projects Administration, research conducted by American industry is very generally concentrated in a small portion of the companies in the separate industries. In a summary Mr. Gill says:

"Of the 50,000 research scientists, technicians and assistants employed by American industry in 1938, half were attached to 45 large companies, the other half were distributed among more than 1,700 firms, and over 150,000 manufacturing concerns were without research laboratories. By and large, the greatest amount of research is done in the relatively new, mass-production industries, such as electrical goods, rubber, petroleum, industrial chemicals, and automobiles."

In per cent. of research workers concentrated within one quarter of the companies in each separate industry in 1938, all industries averaged 81.8%, and of nine selected industries the rubber industry ranked highest with 90%, followed by automobiles at 89%, industrial chemicals at 88.3%, and petroleum at 85%. With respect to per cent. to total research workers in 22 industries, rubber ranked seventh in 1938 with 5.1%. Chemical and allied products employed 21.5% of the total, and petroleum accounted for 11.4%. However as to the increase in research workers from 1927 to 1938, the rubber industry was sixteenth.

Of eighteen industries rated, in 1927 rubber was listed third with 78 research workers per 10,000 wage earners and in 1937 was fourth with a ratio of 173 employed in research to 10,000 wage earners. The chemicals and allied products industry ranked first in both 1927 and 1937 with 137 and 303 respectively. It is also of interest to note that in 1938 of 19,797 research employes in 1,224 companies distributed throughout 22 industries, 4.1% were directors, 28.5% were chemists, 23.2% were engineers, 3.5% were physicists, 3.3% were metallurgists; while 8.5% were classified as other professional workers and 16.9% as laboratory assistants with 0.6% unspecified and all others comprising 11.4%. In the rubber industry of 1,035 research employes in 26 companies 5.4% were directors, 22.6% were chemists, 26.3% were engineers, 1.3% were physicists; while 4.3% were classified as other professional workers and 33.2% as laboratory assistants with all others comprising 6.9%

Although the total laboratory personnel reported for 1938 was 49,564, because of non-uniformity with earlier surveys, 44,292 workers distributed over 1,722 companies was selected as a figure for 1938 that would be comparable to 7,367 workers and 265 companies in 1920. The growth in research activities is indicated further by the fact that 244 identical companies in 22 industries increased their research personnel 119% from 7,811 in 1921 to 17,136 in 1938. Of these, six rubber companies increased from 485 workers in 1921, to 1,477 in 1938, or 205%.

From these statistics there appears to be a close relation between research and mass production as well as between research and large company units. Although the question as to cause and effect is debatable, the conclusion may well be reached that because of the productive results those industries and those companies that have enlarged their research activities have also grown into the mass-production stage. The rubber and other industries which are prominent in supplying our requirements and conveniences are among the believers in research. When correlated with advancement, these statistics serve to establish as factual the value of research.

Employed Labor Holds Favored Position

ALTHOUGH weekly pay envelopes of employed wage earners were slightly less in January for the first time since July, a recent survey of 25 major industries by the Division of Industrial Economics of The Conference Board shows that the January average was still equal to the high point reached in the 1936-1937 period. Compared with January, 1939, there was an increase of 8.1%; while the change from the average for 1929 was a decrease of only 1.6%. In 1929, however, wage earners had to work a substantially greater number of hours per week to obtain similar money wages.

The position of the employed worker remains very favorable in the light of the amount of goods and services his money income can purchase. After allowing for a fractional rise in the cost of living in January, "real" weekly earnings were 8.1% higher than in the corresponding month of 1939. Even more striking is the fact that they stood 15.4% higher than the average for 1929. For last January, when industrial production as measured by leading indexes was near the peak for 1939, total man hours stood 23.6% below the average for 1939.

With the effective purchasing power for individual weekly earnings higher than in 1929 and with a shorter work week, an enhanced position is held by that portion of the public which is fortunate enough to be employed. Although the avowed intention of governmental programs has been to spread the work and relieve unemployment, statistics indicate a failure to realize that ambition but on the contrary show an actual trend toward a concentration in distribution of income while the unemployment problem remains unsolved.

S. C. Stillwagon

EDITOR

What the Rubber Chemists Are Doing

Ten Papers to Be presented before Rubber Division at A. C. S. Spring Meeting

THURSDAY and Friday, April 11 and 12, are the days set for the spring meeting of the Division of Rubber Chemistry, of the American Chemical Society, to be held at the Hotel Gibson, Cincinnati, O. The first technical session will be held Thursday afternoon, closing with the Crude Rubber Committee's report. The second and final session will be held Friday morning, followed by the business meeting. The banquet, being arranged by a committee headed by V. L. Smithers, is scheduled for Thursday evening. Abstracts of the ten division papers follow.

Correlation of Nitrogen and Ash with Total Solids Content of Latex. Nitrogen and ash determinations have been made on *Hevea* latices of widely varying total solids content, with the result that both of these values have a constant value on the latex independent of the solids content. These values are approximately 0.25% for the nitrogen and 0.5% for the ash. It is also shown that residual nitrogen directly associated with the rubber is a constant value (0.1%) and is independent of the purification of the latex. J. McGavack and C. E. Rhines, United States Rubber Co., General Laboratories, Passaic, N. J.

Diffusion of Sulphur in Rubber and Its Relation to Vulcanization. The absorption of sulphur by various types of rubber has been determined at temperatures ranging from 25 to 86° C. The absorption technique has been shown to be unsatisfactory for determining the solubility of sulphur in rubber since sulphur in excess of that required for saturation crystallizes within the rubber. The absorption of sulphur by rubber appears to be osmotic in nature since it decreases with increased stiffness of the rubber.

It has been shown that sulphur diffuses into masticated crepe rubber at the rate of 0.0056 cm. per hour at 56° C. The rate of diffusion of sulphur through masticated crepe and vulcanized rubber has been determined by the cell method at temperatures ranging from 58 to 96° C. The rate of sulphur diffusion through ebonite at 86° C. has been found to be practically nil. The solubility of sulphur in masticated crepe rubber has been determined in milling experiments, and the results agree very closely with those given by Ira Williams, who used a different method. The rate of solution of sulphur in rubber during milling has also been determined.

Heterogeneous or spotty vulcanization has been found to result from undissolved and non-uniformly dispersed sulphur in the unvulcanized mix. This heterogeneity has been shown to adversely affect the physical characteristics of the vulcanized rubber resulting in a decrease of its tensile strength to less than 10% of the best value in extreme cases. The effect of variations in mixing technique on heterogeneity, rate of vulcanization, and physical tests has been discussed, and the need of further study in this field pointed out. A. R. Kemp, F. S. Malm, G. G. Winspear, and B. Stiratelli, Bell Telephone Laboratories, New York, N. Y.

The Effect of Hydrogen Sulphide on the Rate of Vulcanization of Rubber Compounds. It was found that rubber dissolved 1% of hydrogen sulphide at room temperature. This amount of gas is sufficient to retard the rate of vulcanization of all types of accelerators. However the physical properties of the hydrogen sulphide treated compounds containing aldehyde-amines, dithiocarbamates, thiuram sulphides, and litharge were poorer no matter how long the time of vulcanization was increased; while similarly treated compounds containing the mercaptobenzothiazole type and diphenylguanidine accelerators produced physical properties equal to the untreated compounds on prolonging the time of vulcanization. There was little or no evidence of the formation of zinc sulphide or of the reaction of sulphur with hydrogen sulphide. E. W. Booth and D. J. Beaver, Monsanto Chemical Co., Nitro, W. Va.

Hysteresis in the Crystallization of Stretched Vulcanized Rubber from X-Ray Data and the Correlation with Stress-Strain Behavior and Resiliency. X-ray diffraction patterns have been made under carefully controlled conditions of tensile strips of vulcanized rubber of known composition and cure, at intervals of 25% elongation up to 500% during elongation and at the same intervals during retraction. The fiber diffraction patterns have been quantitatively measured for intensity with a densitometer; these values plotted against elongation give highly characteristic hysteresis loops which are very sensitive indications of the composition and previous history of the sample. These loops are determined for the initial extension of the original sample and for the tenth cycle of elongation and retraction. Correlation is established between the X-ray loops, indicative of the establishment and retention of crystallization or ordered arrangement of molecules, and stress-strain diagrams which show remarkable similarity to the X-ray loops, and the impact resiliency, as a means of giving a fundamental molecular explanation to the physical and mechanical properties. The presence or absence of 0.25% of a vulcanizing agent is found to have a profound effect upon these parallel effects. The investigation here reported is the first of a series designed to discover the effects of every variable upon inception of molecular orientation and its persistence upon removal of the stretching deformation. George L. Clark, University of Illinois, Urbana, Ill.; Ernest Blaker and John M. Ball, R. T. Vanderbilt Co., Inc., New York.

Machine and Methods for Testing Mechanical Stability of Latex. Methods and machines have been studied for making mechanical stability tests on latices. The results indicate that a constant-speed machine and fixed solids in test samples give reproducible results at widely separated laboratories. Chas. K. Novotny and Wilbur F. Jordan, Firestone Tire & Rubber Co., Akron, O.

X-Ray Examination of Polyisobutene. Complete measurements of the fiber pattern of stretched polyisobutene have been made, and the identity period along the fiber axis has been found to be 18.63 ± 0.05Å., a value which is in close agreement with that previously published by Brill and Halle. It has been determined by means of patterns obtained from samples inclined at various angles to the X-ray beam that only the even orders of the fiber period occur and that the eighth order is the most intense. These facts furnish support for a 1:3, i.e., a head-to-tail structure for polyisobutene and indicate that eight isobutene units are contained in the fiber period. This information together with the fact that a shortening of 1.6 Å. from the planar zigzag form occurs suggests that the chain configuration is that of a helix in which the methyl group pairs situated on the alternate chain carbon atoms complete one revolution about the chain molecule in the fiber period distance. On the basis of the symmetry provided by the above chain configuration, it is shown that the orthorhombic cell a = 6.94 Å., b = 11.96 Å., c = 18.63 Å. (fiber axis), and the space group $D_2^4 - P_{2\,2\,2}$ are in agreement with all the X-ray data. The cell is pseudohexagonal. 1.9 repeating units per unit cell result on the basis of a density of 0.91 for stretched polyisobutene. C. S. Fuller, C. J. Frosch, and N. R. Pape, Bell Telephone Laboratories.

The X-Ray Structure of Rubber-Carbon Black Mixtures. The effects on the X-ray structure of stretched rubber caused by the incorporation, in varying quantities, of carbon blacks of different average particle sizes were investigated. The minimum elongation necessary for the fiber diagram to appear was determined by photometric measurements

of the patterns for a range of elongations. For the same black this minimum elongation decreased as the loading increased. For the different blacks the minimum elongations were in the same order as the average particle sizes of the blacks, the loading being the same. The results were interpreted as making evident the existence of a region of enhanced stress in the vicinity of the particles. This field of stress was also apparent from the increased length of the diffraction spots, an effect which was found to depend upon the particle size of the black. The bearing of the X-ray results on various theories which have been advanced in regard to reenforcement by carbon black is discussed as is the possible relation of the observed X-ray structure to the general physical effects of reenforcement. It is concluded that the X-ray data can be explained on the basis of the known stresses in the vicinity of large inclusions in stretched rubber. The field of stress shown by the X-ray patterns to exist about the particles implies that the rubber molecules are firmly attached to the surface and that the rubber works at a higher point on its stress-strain curve. The reduction in plasticity which might reasonably be expected due to the immobilized molecules appears sufficient to account for the rest of the results. S. D. Gehman and J. E. Field, Goodyear Tire & Rubber Co., Akron.

Dilatometer Studies of Pigment Rubber Systems. In dilatometer measurements a gum stock decreases in volume, and certain pigmented stocks increase in volume when stretched. Volume decrease is attributable to fibering or orientation of the rubber molecules, and the increase in volume of pigmented stocks to the formation of vacuoles at the pigment-rubber interfaces. State of cure had a marked effect on dilatometer results. An undercured gum stock exhibited a greater volume decrease, and the decrease occurred more readily than with an optimum cure. In highly pigmented stocks the long cures showed a greater volume increase than the short cures. Zinc oxide was the pigment employed in this study, and it was noted that particle size and pigment loading influenced the volume increase on stretching; the larger the particle size the greater the volume increase. For a given zinc oxide the volume change increased with increments of zinc oxide. H. C. Jones and H. A. Yiengst, New Jersey Zinc Co., Palmerton, Pa.

The T-50 Test Applied to Reclaimed Rubber. The use of the T-50 test as a means of evaluating reclaimed rubber has been investigated. Tire and tube reclaims of varying alkalinities were compared in typical tread and inner tube formulas. Variations in curing rates of these compounds caused by the reclaims are shown more distinctly by T-50 tests than by tensile and modulus tests. The introduction of successive increments of reclaimed rubber into a tread compound was accompanied by a progressive reduction in T-50 values during the early cures although the ultimate values attained were the same. T-50 values are shown to be more uniform than tensile strength values on the reclaim-sulphur mix. Variations in curing rates of reclaims may be interpreted by means of T-50 tests on the reclaim-sulphur mix, but such tests are not so informative as tests on type compounds in which the reclaims are used. Henry F. Palmer and Robert H. Crossley, Xylos Rubber Co., Akron.

Dielectric Properties of Plasticized Polyvinyl Chloride. The dielectric properties of plasticized gamma polyvinyl chloride are of interest not only because this material is of great practical importance as a flame-proof, oil-resistant, electrical insulation, but because it may throw light on the mechanism of dielectric loss in certain types of solid insulating materials. New data are presented for the power factor and dielectric constant at 15, 60, and 1,000 cycles of stabilized polyvinyl chloride-tricresyl phosphate mixtures varying from 0 to 60% plasticizer over the temperature range from —20° to +120° C. The results are consistent with Fuoss' suggestion that the loss is due to two or more factors, an ionic conductance and a dipole rotation. The ionic conductance increases continuously with temperature, but the dipole rotation produces a maximum in the curve for power factor versus temperature for each sample. The temperature of this maximum varies from 98° to 2° C. for this range of plasticizer content.

At room temperature these samples ranged from a hard, horny material to a soft, elastic material. However at the temperature of the power factor peak the mechanical properties were remarkably similar. The following table shows the durometer hardness at the temperatures of the 60-cycle power factor maxima for different stocks:

Plasticizer, %	0	10	20	30	40	50	60
Temperature of P.F. peak, °C.	95	77	61	43	27	11	−2
Durometer hardness	95	96	96	95	93	89	81

The small difference in durometer hardness of these compounds at the temperatures of the power factor peaks suggest very strongly that the mechanism which hinders dipole rotations is very similar to the mechanism that hinders small macroscopic elastic deformations. The effect of adding plasticizer is roughly equivalent to raising the temperature; so it is probable that both the rotation of the active C—Cl dipoles and the slipping of $(CH_2CHCl–)_n$ chains past each other are hindered by the secondary valence forces around the Cl atoms. The activation energy for small deformations should then be related to the energy barriers hindering dipole rotations.

The power loss due to ionic conductance can be greatly reduced by adding stabilizers, but they have little effect on the peak due to dipole rotations. By the suitable choice of plasticizer and stabilizer, compounds can be made whose power factor decreases continuously from room temperature up to 80° or 100° C. J. M. Davies and W. F. Busse, The B. F. Goodrich Co., Akron.

Three Papers, Two Movies Presented before N.Y. Group

AN EXTENSIVE technical program, covering plastics, synthetic rubber, and carbon black was featured at a meeting of the New York Group, Rubber Division, A. C. S., held at the Building Trades Employers' Association, Two Park Ave., New York, N. Y., March 15. The technical session, which opened at 4.30 p.m., attracted 300 members and guests, while the dinner that followed was attended by 235.

The program began with a movie on plastics, "The Fourth Kingdom," followed by a talk on "Plastics Up-to-Date," by C. A. Norris, of the Bakelite Corp., who traced the history, development, and production of plastics and plastic products.

Speaking on "Chemical Trends in the Field of Synthetic Rubbers," Per K. Frolich, Standard Oil Development Co., emphasized the economic and technical significance of the fast-growing synthetic rubber producing industry, pointing out that, with the petroleum industry producing basic material on a mass-production basis, costs may be substantially reduced in the future. The structure of basic chemicals for the various types of synthetic rubbers was discussed. The speaker pointed out that, in the production of Buna rubbers, mass-polymerization methods have given way to polymerization in the emulsion state with solidification in much the same way as latex is coagulated. Of significance in the copolymerization of butadiene and acrylonitrile is evidence of the formation of cross linkages, which may be the reason for the extreme toughness of this copolymer, Perbunan.

I. E. Lightbown, also of Standard Oil, then discussed "Perbunan—Its Properties and Compounding." Reviewing the basic properties of Perbunan with a specific gravity of 0.96, he said it has a slight sweet odor and cures much the same as natural rubber, utilizing sulphur, zinc oxide, and fatty acids. Referring to the cross linkages mentioned by Dr. Frolich, Mr. Lightbown suggested that natural rubber, without appreciable cross linkaging, might be considered analagous to tire cord fabric, and Perbunan analagous to square woven fabric. In contrast to Buna S, the butadiene and styrene copolymer, Perbunan cannot be plasticized by heat treatment. To achieve proper mastication and plasticization of Perbunan, the speaker recommended that the rolls of the mill be set tight, that temperature of rolls be cold, and that a small batch be used. Stressing the importance of plasticizers, he said that, besides the regular rubber softeners, materials such as di-

benzyl ether and tricresyl phosphate could be used with effectiveness.

Figures demonstrating the resistance of Perbunan to various solvents and oils as compared with rubber were presented. But it was emphasized that Buna S is no more resistant to oils than is natural rubber. Although the tensile strength of Perbunan without reenforcement is only about 800 pounds per square inch as compared with 3,500 pounds per square inch for rubber, the resultant effect of carbon black, with maximum tensile strength at 40 to 60 parts of carbon black to 100 parts of Perbunan, is of the same order as that of similar rubber compounds. Mr. Lightbown suggested that the marked reenforcing effect obtained in the case of Perbunan might shed light on the still unsolved problem of reenforcement mechanism.

The technical program was concluded, following dinner, with the presentation of Godfrey L. Cabot, Inc.'s sound film on carbon black, "Inside the Flame," introduced by the firm's technical director, F. H. Amon.

C. R. Haynes, group chairman, promised an early mailing of a questionnaire; so members may indicate their preference regarding a June outing in New Jersey on a Saturday, or in Westchester County on a Friday, or no outing at all. L. D. Walker, of the Triangle Conduit & Cable Co., was named executive committee member to replace R. Berkowitz, deceased. The 1940 group essay contest rules will be found on page 58.

Los Angeles Group Meets

THE Los Angeles Group, Rubber Division, A. C. S., met March 5 at the Mayfair Hotel, Los Angeles, Calif., with 69 members and guests in attendance. Carl Stentz, president, Latex Seamless Rubber Co., discussed processes used at his plant and displayed a number of latex-covered products. The second feature on the program was a film covering the manufacture of aluminum and aluminum products.

An electric shaver, special prize donated by Ed Royal (H. M. Royal), was won by L. F. McDonald (Goodrich). Six bottles of perfume, donated as door prizes by Naugatuck Chemical, through G. C. Follett, its representative, were won by J. A. Huff (U. S. Rubber), F. Baglin (West American), F. Woerner (C. P. Hall), L. Horchitz (Goodrich), J. G. Krough (U. S. Rubber), and F. Shew (Darnell). A. S. Rocklen, Golden State Rubber Mills, donated table favors, purses containing imitation coins. The next meeting will be April 2.

Chicago Group Views Cabot Film

OVER 100 members and guests of the Chicago Group, Rubber Division, A. C. S., enjoyed the motion picture on carbon black, "Inside the Flame," produced by Godfrey L. Cabot, Inc., at a meeting of the group on March 15 at the Hotel Sherman.

Buffalo Group Proposed

A LIST of 68 individuals in the Buffalo, N. Y., area who have promised active support of a local group should permission be granted for its formation, will be submitted to the executive council of the Division of Rubber Chemistry, A. C. S., at the spring meeting to be held in Cincinnati April 11 and 12.

Cadwell Speaks before A.S.T.M.; Committee D-11 Meets

S. M. CADWELL, United States Rubber Co., discussed "Rubber of Tomorrow" at a symposium on New Materials in Transportation, at the 1940 spring meeting of the American Society for Testing Materials, Detroit, Mich., March 6, in conjunction with A.S.T.M. Committee Week. (March 4 to 8). Dr. Cadwell demonstrated certain tests to illustrate some properties of newer rubber products. He pointed to a fallacy that in vibration or oscillation it seemed evident that a piece of rubber would last longest if it returned to the condition of zero strain during each cycle, but that in some cases this is the worst possible choice of conditions. In one example, rubber under a minimum strain of about 200% resulted in a dynamic fatigue life at least one hundredfold greater than when the minimum strain was zero. He differentiated between sponge rubber and cellular rubber in structure and discussed the latter's effectiveness in resisting impacts and its usage for noise and heat insulation. After mentioning other products, he discussed the pneumatic tire and commented on the increasing use of rayon tire cord.

At the 15 meetings of subcommittees and the main session of Committee D-11 on Rubber Products, important recommendations were voted. Changes are to be incorporated in the methods of testing flat rubber belting (D 378), involving shape of specimen for the tention test, thickness measurement, and the relative direction of specimen to belt. A kerosene-benzol swelling test is to be added for use with oil-resistant belting. Three wire and cable specifications (D 27, D 353, and D 469) will be slightly revised, taking into consideration metallic coatings other than tin on the wire. Proposed new specifications cover ozone-resisting insulation.

The abrasion subcommittee is investigating tearing and cutting as tests for resistance to punching and related characteristics. An artificial light aging procedure will be submitted at the next committee meeting. The present test for accelerated aging (D 428) will be issued as two separate standards. Also, a highly accelerated aging test at 80° C. has been developed.

The test methods for compression set (D 395) are to be revised; the major change involves construction of the apparatus for set under constant load. The subcommittee on vibration absorption examined four hand-operated testing machines which will be circulated among members for experimental use and the development of further data. New methods of test for compression flexing (compression hysteresis and heat build-up) will be included in the committee's annual report in June. The liquid rubber products subcommittee discussed proposed methods of test for latex In an extended cooperative test program on hard rubber, twelve cooperating laboratories will test three different compounds.

A new section will investigate the testing of hose used in automotive cooling systems. Methods for examination of all types of rubber hose (D 380) will continue as tentative with a revision of hydraulic tests for high-pressure hose.

Technical Committee A on Automotive Rubber, which functions as a joint committee of the Society of Automotive Engineers and A.S.T.M., prepared specifications for first-grade motor mounting compounds classified by physical properties and for hydraulic brake hose. These have been referred for approval to the Standards Committee of the S.A.E. Technical Committee A has also developed procedures for load deflection of rubber in compression, which were approved by Committee D-11.

Accelerators and Plastics Discussed at Providence

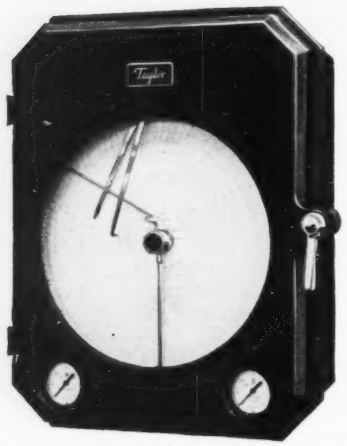
ACCELERATORS and plastics were the two topics at the spring meeting of the Rhode Island Rubber Club, held at the Narragansett Hotel, Providence, R. I., on March 1. Preceding the meeting, a bowling tournament was held at the Casino Bowling Alleys.

The first speaker at the technical session, R. L. Sibley, director of research and development, Monsanto Chemical Co., discussed "Uses and Manufacture of Organic Accelerators." Dr. Sibley reviewed briefly the early history of these accelerators and the development which followed the introduction of aniline, outlining the chemical reactions involved in the production of successive basic products. He emphasized the importance of aniline, not only as the first organic accelerator, but as a basic material used in the manufacture of accelerators and antioxidants today, pointing out that 40% of the aniline used today is consumed by the rubber industry. Dr. Sibley also dwelt upon the applications of various accelerators to a wide range of rubber compounds.

Edward Vail, New England sales engineer of the Bakelite Corp., then spoke on "Plastics." Mr. Vail outlined

(*Continued on page 88*)

New Machines and Appliances



Redesigned Fulscope Controller

Redesigned Controller Features New Supplementary Control

TO MEET the demand for higher quality in control, a redesigned line of Fulscope air-operated recording and indicating controllers for temperature, pressure, rate of flow, and liquid level has been introduced. In addition to the conventional proportional response and automatic reset forms of control, the new instrument introduces a third process-control effect, known as Pre-Act. This feature makes control-valve corrections according to the rate of control-point deviation. Thus over-peaking or oscillating is greatly reduced by an immediate and relatively larger control-valve action than would occur without the Pre-Act device. Furthermore Pre-Act is said to stabilize operation after a change in set point and when equipment is started up.

Other advantages claimed for the new line of instruments include: adjustability over wider ranges than previously; complete adaptability to process time lag; improved and simplified air system; ready accessibility for adjustments; and interchangeability of unit assemblies. There are five standard types of Fulscope recording and indicating controllers: fixed high sensitivity; adjustable sensitivity; adjustable sensitivity with automatic reset; adjustable sensitivity with Pre-Act; and adjustable sensitivity with automatic reset and Pre-Act. Taylor Instrument Cos., Rochester, N. Y.

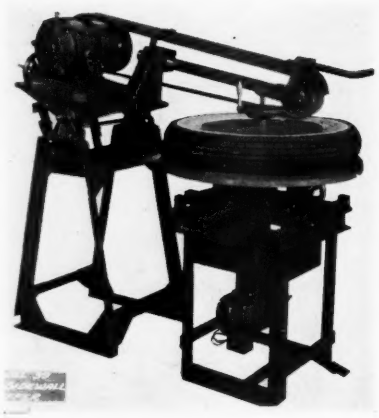
Photo-Electric Colorimeter

COLORIMETRIC methods of determination may be used in controlling the presence of copper or manganese in zinc oxide, lead oxide, whiting, and other fillers. These methods also are satisfactory in the proofing industry where the fabrics to be coated with rubber must be controlled to maintain a copper and manganese content of less than 50 parts per million.

With slight modifications, the Lumetron colorimeter can be used for turbidimetric determinations. Typical examples of turbidimetry in the rubber industry are determinations of particle size of carbon black, sulphur, and latex. Free ammonia in latex may be determined colorimetrically by use of the Nessler reagent. The Lumetron photoelectric colorimeter, claimed to give reproducible and linear readings within very narrow limits, uses two blocking-layer photocells in a balanced circuit. This makes it possible to operate the instrument from the power line without the use of batteries or constant-voltage transformers. Line voltage changes have no effect upon the readings obtained. Dr. F. Loewenberg.

Sanding Machine for White Sidewall Tires

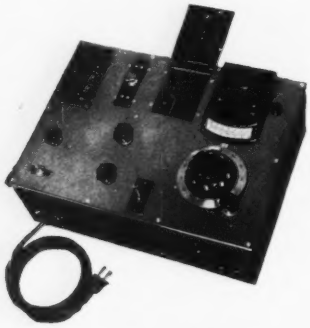
IN MOLDING white sidewall tires, surface flow of the stock at the black-white juncture produces an irregular line. This surface irregularity is removed by a specially designed sanding machine to produce a smooth-circle juncture. A belt, 3½ inches wide and nine feet long, has a sanded surface for the buffing operation. Operated by a 1½ h.p. motor, the belt has a linear speed of 4,500 feet per minute. The table on which the tire revolves turns at a speed of 19 r.p.m. against the belt surface and is driven by a ⅓ h.p. motor. A foot clutch provides for hand operation of the table when necessary; while wooden adapters allow for different rim-size tires. National Rubber Machinery Co., Akron, O.



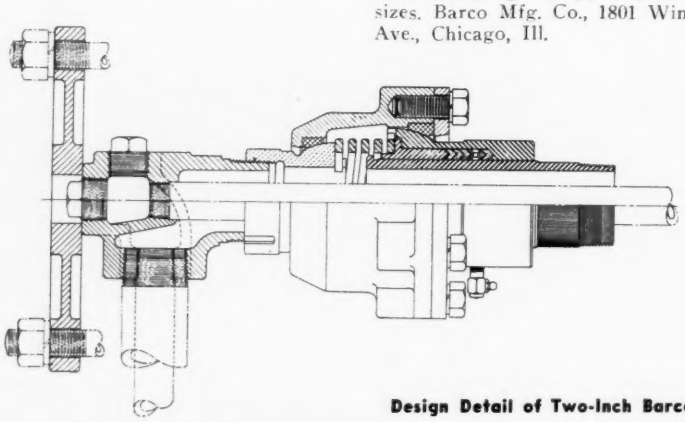
White Sidewall Tire Buffer

Two-Inch Revolving Joint

BARCO revolving joints are suitable for rubber mills, extruders, and calenders, and for other applications requiring the transfer of fluids or gases from a stationary supply pipe to a rotating member. Previously made in sizes up to 1½ inches, the joint is now being built in the two-inch size (illustrated), thus extending its application to larger machinery. In designing the new joint several changes have been made in the construction and in the syphon pipe arrangement. Further development of this type of joint will include the design of 2½- and three-inch sizes. Barco Mfg. Co., 1801 Winnemac Ave., Chicago, Ill.



Lumetron Colorimeter



Design Detail of Two-Inch Barco Joint

New Goods and Specialties



Lorelei Bathing Cap

New "Strapless Aviator" Bathing Cap

TESTED last year by Aquacade performers at the New York World's Fair, the Lorelei bathing cap, a patented "strapless aviator," is now available for general distribution. Said to combine all the advantages of the aviator type of cap, plus the streamlined features of a diver, its outside is developed in crinkly crepe; the smooth inner surface makes it easy to pull on and off; while Aqua-Seal inner rings keep the water out. The manufacturer also claims that the cap will stay firmly on the head even though its wearer dives from high places because it is shaped to the head in such a manner as to fit snugly, but cause no discomfort. The Seamless Rubber Co.

Latexed Vinyon Felts for Shoe Trade

TWO types of felts, made from Vinyon, the new synthetic textile fiber, and treated with latex, are now being used in shoe manufacture. The Doubler felt is impregnated with latex solution; while the Plumper felt is latex-coated on one side. The material is used in the forward part of the shoe, either to add a feeling of plumpness to the leather or to act as a filling and strengthening material between the inner lining and the leather. This type of felt is also being used in the manufacture of bags or suitcases as an underlay material. American Felt Co.



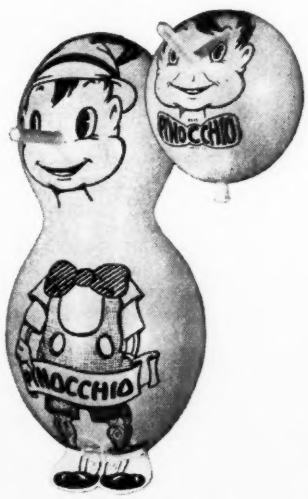
"Sea Dive" Mask

Koroseal Swivel Gaskets for Fire Hose

RECENT products made from Koroseal are swivel gaskets for fire hose. According to Koroseal's manufacturer, the B. F. Goodrich Co., Akron, O., use of the material for this purpose has the following advantages over ordinary rubber gaskets: the smooth glaze on the surface of Koroseal eliminates the need of spanner wrenches and makes it possible to tighten couplings by hand; Koroseal gaskets do not harden with age or lose their resilience; locking and freezing of swivels are eliminated, since Koroseal gaskets contain no sulphur or other compounding material which will cause corrosion of the coupling metal; and as the new gaskets absorb practically no water, they do not swell or lose their shape.

Mask for Sea Diving

GOGGLE-FISHING, popular for years in the Mediterranean, is now gaining in favor in this country. The "Sea Dive" mask, an aid in this new aquatic sport, is made of molded soft rubber with a heavy glass window. An elastic band, fastened by a rust-proof buckle, holds the mask firmly to the face. Sea Net Mfg. Co.



Both these Pinocchio toss-up and head balloons, made by The Oak Rubber Co., have the characteristic long nose of Walt Disney's new movie character. Oak also makes standard round and other shaped balloons printed with two-color pictures of Pinocchio.



G & J "Classic"

New "Classic" Tire Marks G & J's Fiftieth Year

INTRODUCTION of the new and improved "Classic" passenger tire by the G & J Tire Division, United States Rubber Co., New York, N. Y., marks the fiftieth year of tire building by one of America's oldest tire organizations. The tire features a triple-action, wedge-grip tread that is said to increase the gripping action on the road and the wearing qualities of the tire.

Large Pickling Tanks Lined by Plioweld Process

FOUR large pickling tanks are currently being rubber lined by the Plioweld process. The completed tanks, built in two sections each, will be 80 feet long, 7 feet 4½ inches wide, 5 feet 2½ inches deep. The rubber lining involves the use of 3,300 pounds of rubber for each tank and 1,600 pounds for each cover section. After application of the rubber lining, each tank section is vulcanized in a 15-foot diameter vulcanizer. Delivery of completed sections is being made by tractor-trailer; each unit comprises a complete load. Goodyear Tire & Rubber Co.



Application of Rubber Lining to Pickling Tank

UNITED STATES

Business Still Dropping; Upturn Expected Soon

The decline in industrial production, begun in January and sharply accelerated in February, appeared to be leveling off last month, giving rise to the hope that the bottom has been reached and that improvement, gradual if it should materialize, will occur in the spring. Some economists believe, however, that unless a decided jump in new orders or a new wave of business confidence generated by a domestic political development, large-scale pump priming, or suddenly increased war orders should appear, renewed depression is on its way.

Export trade continues good. Inventories are still rising, but more slowly. Unemployment, though, is up.

Machinery, aircraft, and rayon industries remain at high production levels. Gains were also recorded last month in lumber and oil output. Radio manufacturers expect 1940 to be a banner year. Greater efforts are being made to provide the public with television.

Fluctuations occurred in March in power and cotton mill production, carloadings, tin plate operations which fell to 54%, then rose to 56% of capacity, and steel ingot output which declined to 63.5%, increased to 64.7%, and dropped to 60.7% later in the month. Hosiery mills are running at about 50% capacity, the lowest in a decade; while machine tool orders are off.

Automobile output varied last month, ending with a less than seasonal rise. Production is due for a decline in April because dealers' stocks are accumulating and, although sales have been good, they are not up to early forecasts. The best first quarter since 1929 is predicted by the industry with output at about 1,300,000 units. Production in February was the highest since February, 1929, and the March figure is set at 440,000. February sales of new cars and trucks totaled 421,690, but foreign markets are disappearing. Used car sales in this country have advanced, and dealers' stocks dropped.

The rubber industry seems to be marking time although mechanicals output is good and hard rubber production is holding its own, but insulated wire registered sharp declines. Tire output slumped somewhat this year; yet an early upturn is expected. Contrary to previous pessimism, tire manufacturers now believe 1940 tire replacement business, which should get under way this month, will be only slightly below the 37,500,000 units sold in 1939; thus total sales this year may approximate the 1939 figure, 56,975,000 units, highest since 1929.

U. S. Firms to Build in South America

United States Rubber Co., Rockefeller Center, New York, N. Y., has announced it will build a tire and footwear plant in Argentina. Fred S. Carpenter, formerly factory manager of the company's Los Angeles, Calif., tire factory, arrived in Buenos Aires on March 6 to select a site and start construction of the plant, where he will have complete charge of all operations. Chauncey S. Garland, industrial engineer in the U. S. Rubber footwear plant at Naugatuck, Conn., will head the footwear division; while George W. Seiberling, an executive at the Detroit, Mich., tire factory, will have charge of tire production at the new plant. C. M. Spinning, control manager of the Los Angeles factory, will head finance and accounting at the Buenos Aires plant. Details regarding the structure of the company, additional personnel, plant capacity, etc., have not been completed, but it is expected that production will begin in the fall.

General Tire in Venezuela

The General Tire & Rubber Co., Akron, upon the return from South America of Joseph A. Andreoli, vice president and manager of the General Tire & Rubber Export Co., stated last month that it will erect a new tire plant in Venezuela, but so far no technical men have been sent there from Akron or has any final decision been made regarding the matter. The company further added that while the output of the plant at first will be limited to tires and tubes, it is expected that eventually the Venezuelan firm will produce other rubber and allied products. General Tire and a group of Venezuelan business leaders have already formed a company, Compania Anonima Nacional Manufacturera de Caucho y Neumaticos General, capitalized at 1,750,000 bolivars, to construct a tire plant at Chacao, to be in charge of technicians from Akron, to produce 50,000 tires yearly for the Venezuelan market. Dr. Alfredo Machado Hernandez is president of the new company, and Mr. Andreoli is a director. Land for the factory site has been purchased, construction plans are being completed, and it is believed the plant will be in operation this year.

Special concessions have been obtained from the Venezuelan government in the way of appreciable reductions in duty on raw materials to be shipped at first from the United States. Eventually it is planned to develop sources of raw material in Venezuela to obtain needed rubber and cotton.

CALENDAR

Apr. 1-20. 1940 American Toy Fair. Hotel McAlpin, New York.

Apr. 5. Boston Rubber Group. University Club.

Apr. 8-12. American Chemical Society. Spring Meeting. Cincinnati. Division of Rubber Chemistry. April 11 and 12. Hotel Gibson.

Apr. 9-10. Midwest Power Conference. Palmer House, Chicago.

May 2. Los Angeles Rubber Group. Mayfair Hotel.

May 13-15. American Institute of Chemical Engineers. Statler Hotel, Buffalo.

May 16-17. National Battery Manufacturers Association. Spring Meeting. The Greenbrier, White Sulphur Springs, W. Va.

June 3-6. National Assn. of Purchasing Agents. 25th Annual International Convention and Inform-A-Show. Hotel Netherland Plaza. Cincinnati.

June 6-8. 17th National Colloid Symposium, Division of Colloid Chemistry, A. C. S. University of Michigan, Ann Arbor.

Goodrich in Chile?

Press reports from Santiago, Chile, which The B. F. Goodrich Co., Akron, will neither confirm nor deny, indicate that the rubber company has obtained permission from the government in Chile to build a tire factory there.

Rubber at the Fair

The 1940 World's Fair in New York, to open next month, will have several new features and exhibits besides many of the displays of last year, including those of rubber companies. The Firestone Tire & Rubber Co., Akron, with a larger and more elaborate exhibit, will transform the huge rotunda of its building into a Liberian rubber plantation, where the various operations in clearing the land, planting, and tapping rubber trees will be dramatized. From the rotunda visitors will again view the modern tire factory where tires will be made, one every four minutes.

The B. F. Goodrich Co., Akron, is tripling the seating capacity of its outdoor thrill arena where Jimmie Lynch and his troupe will perform even greater automobile tire-testing daredevil stunts than last year. Inside the exhibition building additional product display areas will be animated, and a new surprise attraction is promised. A new method of controlling the heavy traffic of visitors is also being installed. Several added comforts are being provided in the offices and lounge rooms in anticipation of the visit of several thousand Goodrich representatives in connection with the observance of the seventieth anniversary of the founding of the Goodrich company.

Billy Rose has again awarded the exclusive contract to supply all the bathing caps for the 1940 Aquacade to The Seamless Rubber Co., New Haven.

EASTERN AND SOUTHERN

U. S. Rubber Moves; Announces New Appointments

United States Rubber Co., starting March 28, transferred its quarters from 1790 Broadway, New York, N. Y., to the new U. S. Rubber Bldg. in Radio City, where it will occupy the top eleven of twenty floors. The entire moving job was completed and offices ready for business by April 1.

New Appointments

President F. B. Davis, Jr., has announced that Edward H. Marsh, Jr., for many years vice president of The Fisk Tire Export Co., Inc., Chicopee Falls, Mass., now a subsidiary of United States Rubber Co., has been elected vice president, general manager, and a dirctor of United States Rubber Export Co., Ltd., with headquarters in New York.

Edward Evans, formerly in the advertising and sales promotion department of U.S. Tire Dealers Corp., has assumed the duties of advertising manager of the Fisk tire sales division, with headquarters in Chicopee Falls, Mass., succeeding Henry Hurd, who recently resigned to become vice president of Mechanical Man, Inc.

John M. Miller, who resigned as manager of the Firestone Rubber & Latex Products Co., Fall River, Mass., is now assistant factory manager of the U. S. Rubber Providence, R. I., plant, where M. G. Burnett is factory manager.

Edward Carroll, traffic manager of the U. S. Providence, R. I., plant, recently was elected president of the Traffic Club of the Providence Chamber of Commerce.

Safety Contest

E. W. Beck, supervisor of safety, U. S. Rubber, recently reported that the company has conducted annual safety contests for the past sixteen years, during which time the accident frequency and severity rates have consistently improved. The results of the contest for 1939, which showed the best accident frequency rate on record, as announced by President Davis, follow: *Larger plants:* winner of president's prize, $300, Indianapolis, Ind., plant; second prize, $150, Gillette Rubber Co., Eau Claire, Wis.; third prize, $75, Passaic, N. J., plant. *Smaller plants:* president's prize, $100, Shoe Hardware Division, Waterbury, Conn.; second prize, $75, Development Division, Passaic; third prize, $50, Shellyville Mills.

New Rubber Firm Formed

Dural Rubber Co., Flemington, N. J., incorporated in New Jersey on February 17 with a capitalization of $100,000, has purchased the plant of the defunct Dural Rubber Corp., renovated it, and installed new machinery for making automotive rubber products for the manufacturer, material for shoe manufacturers, and stair treads, drain boards, tire patches, and mechanical molded goods. Under normal conditions thirty to fifty workers will be employed. Executives include Robert J. Heiney, president and general manager, Samuel J. Heiney, vice president, and I. W. Gleason, secretary-treasurer.

Manhattan Rubber Mfg. Division, Raybestos-Manhattan, Inc., Passaic, N. J., has announced the following changes in executive personnel necessitated by the recent death of Col. Charles F. Townsend, general manager and chairman of the board. F. L. Curtis, acting assistant general manager, has been named general manager, besides retaining his position as treasurer of Raybestos-Manhattan, Inc.; H. E. Smith, sales manager of the division, has been made assistant general manager; C. T. Young continues as factory manager; and J. H. Matthews, in charge of several departments at the Passaic plant, is now assistant factory manager.

Additional "Modern Pioneer"

When we reported last month[1] on "American Modern Pioneers Honored on Anniversary of U. S. Patent System," the list of scroll winners should have included the name of Frederick H. Untiedt, Washington, D. C., who received recognition for his pioneering work on latex foam and his basic patent covering the latex foam process by which such products are made.

[1] India Rubber World, Mar. 1, 1940, p. 56.

Callaway Mills, LaGrange, Ga., has announced several executive changes, effective April 1. R. E. McTigue, of the LaGrange sales office, has been made personnel director of the company; while Harold H. Barnard has been promoted to the managership of the New York Industrial Fabric Division. Transferred to that division are C. J. White, Jr., chief engineer in LaGrange; W. C. Farley, from the Consumer Division; and Frank S. Graves, formerly sales manager, Valway Division, who is succeded there by Elliott Fulton, of the Chicago office. Howard L. Marsh and Marshall R. Abbott, of the New York and Boston offices, respectively, have been retired to inactive duty, subject to call. W. A. Drisler, of the Industrial Fabric Division, resigned to become vice president and sales manager of the Pond Lily Co., New Haven, Conn.

N. A. W. M. D. Holds Successful N. Y. Convention

One of the most successful conventions in recent years was held by the National Association of Waste Material Dealers at the Hotel Astor, New York, N. Y., March 18-20, inclusive. Registration for this twenty-seventh annual affair totaled 600, with a large attendance from the Pacific Coast. Harry S. Goldstein was reelected president of association, while Nat. E. Berzen and Julius Muehlstein, were reelected president and vice president, respectively, of the Scrap Rubber Institute, affiliated organization. Culminating and outstanding event of the three-day affair was the convention banquet held in the Grand Ballroom of the hotel on Wednesday evening, March 20, with 700 attending. Harry Hershfield, comic strip artist and humorist, served as toastmaster, and John B. Kennedy, news commentator, as guest speaker. The Radio Rogues from the Broadway show, "HellzaPoppin," featured in the entertainment program.

Rubber Industry Contributes to Packaging Progress

Four-time winner in the 1939 All-American Packaging Competition, sponsored by *Modern Packaging Magazine,* was Goodyear Tire & Rubber Co.'s Pliofilm. The possibility that foods formerly packaged only in jars may soon be packed in carton-covered Pliofilm bags was seen in a new package for H. J. Heinz Co. pickles. The carton is die cut so as to provide a window; while the inner bag, containing the pickles and their original liquor, is of transparent Pliofilm. Other awards using Pliofilm went to: William Montgomery Co., Pliofilm-lined coffee sack; Shefford Cheese Co., transparent cheese package; Muscatine Pearl Works, Lucky Day Visible Button Package.

The Wilson Sporting Goods Co. won first award in the Folding Cartons Group for its golf ball display package. In the Set-Up Boxes group The B. F. Goodrich Co. received honorable mention for its box, holding 50-foot lengths of surgical tubing, which permits the tubing to be cut easily to any desired length. A self-dispensing can for rubber cement earned honorable mention for S. S. Stafford, Inc.

Holland House Corp., 10 Rockefeller Plaza, New York, N. Y., officially opened with elaborate ceremonies on March 19. The corporation, a private and non-profit corporation supported by private business interests in the Netherlands Empire and the United States together with participation of the Netherlands government, was formed to promote wider and greater trade activities between the U. S. and the Netherlands, together with better basic relations between the Netherlands East Indies and West Indies and this country.

The Barber Asphalt Corp., Barber, N. J., last month named Joseph M. Roebling to the board to succeed the late Arthur M. Sewall. The new director is also first vice president of John A. Roebling's Sons Co., Trenton, N. J.

Charles T. Wilson Co., Inc., dealer in crude rubber and latex, 99 Wall St., New York, N. Y., has appointed J. B. Ruth & Co., 124 South Central Ave., Los Angeles, Calif., as its new Pacific Coast sales representative.

Wishnick-Tumpeer, Inc., manufacturer and importer of chemical products, 295 Madison Ave., New York, N. Y., has opened a new office in the Dallas National Bank Bldg., Dallas, Tex.

E. I. du Pont de Nemours & Co., Inc., is building a 14-story air conditioned addition to its Nemours Bldg. in Wilmington, Del., to provide 215,000 square feet of office space.

Crescent Wire & Cable Co., Trenton, N. J., has reduced staffs in some departments.

Whitehead Bros. Rubber Co., Trenton, N. J., is erecting a two-story brick building to be used as a medical and employment office, to cost $3,000. Treasurer R. J. Goehrig and his wife have been spending some time at Miami, Fla.

Bevis Longstreth, president, Thiokol Corp., Trenton, N. J., recently returned from a lengthy western trip, reports an increase in orders.

The United States Department of Labor, Washington, D. C., in its recent lists of government supply contracts awarded includes the following: Navy: *cable:* Anaconda Wire & Cable Co., New York, N. Y., $36,466, General Electric Co. Schenectady, N. Y., $50,107; Habirshaw Cable & Wire Division, Phelps Dodge Copper Products Corp., New York, $114,135, Okonite Co., Passaic, N. J., $83,195, Rockbestos Products Corp., New Haven, Conn., $135,684; *pencils:* Eagle Pencil Co., $22,451; *plastics:* E. I. du Pont de Nemours & Co., Inc., Arlington, N. J., $13,883; *tape, shielding:* Industrial Tape Corp., New Brunswick, N. J., indefinite amount; *titanium:* Titanium Pigment Corp., New York, $57,812; *wire:* Habirshaw Cable $11,730, Okonite, $10,343; *webbing:* Buffalo Weaving & Belting Co., Buffalo, N. Y., $43,000; *zinc:* New Jersey Zinc Sales Co., Inc., New York, $11,940; *zinc oxide:* N. J. Zinc Sales, $16,250; War: *cable:* Circle Wire & Cable Corp., Maspeth, L. I., $14,799, GE, $24,960, Phelps Dodge, $15,324; *electrical supplies:* Westinghouse Electrical Supply Co., New York, $30,273; *overshoes:* United States Rubber Co., Naugatuck, Conn., $15,651; *plaster, adhesive:* Johnson & Johnson, New Brunswick, $12,342; WPA: *cable:* E. B. Latham & Co., New York, $18,075; *finish machining and cutting of teeth:* Farrel-Birmingham Co., Inc., Buffalo, $10,530.

Givaudan-Delawanna, Inc., 80 Fifth Ave., New York, N. Y., effective May 20, will move its executive offices and service laboratories to the McGraw-Hill Bldg., 330 W. 42nd St., New York. Larger quarters are required because of the growth and development of the organization, which in conjunction with its affiliated establishments abroad is one of the largest producers of aromatic chemicals and perfume materials in the world.

Nearpara Rubber Co., Trenton, N. J., received increased orders for reclaimed rubber.

The Thermoid Co., Trenton, N. J., one of the winners in the twelfth annual state-wide Inter-Plant Safety Contest, sponsored by the State Department of Labor, recently was awarded a certificate of merit for maintaining a perfect safety record during the contest period from October 1 to December 31, 1939. President Fred E. Schluter attended the dinner-meeting and received the certificate in behalf of Thermoid employes. This is the second time within two months that these workers have received recognition for their safety records.

A. C. Wiebe, molding equipment representative in the metropolitan area for the F. J. Stokes Machine Co., Philadelphia, Pa., on March 18 moved from 150 Nassau St. to 103 Park Ave., New York, N. Y.

Martindell Molding Co., Trenton, N. J., continues to operate 24 hours a day with a rise in orders for all plastic goods. The concern has increased its output with new machinery and equipment.

American Hard Rubber Co., Butler, N. J., which is manufacturing equipment for United States Navy submarines, as a precaution against possible espionage, in the future will employ only native Americans. The plant at present has about fifty foreign-born workers, and those who are not yet citizens will be urged to apply for their papers as soon as possible.

Hewitt Rubber Corp., manufacturer of mechanical rubber goods, Buffalo, N. Y., has completed plans for a new three-story warehouse addition to its plant as part of a $200,000 plant improvement program. The new structure will be 180 feet long, 60 feet wide, of fireproof steel frame and brick construction with glass brick windows, to be completed in July. A portion of the added space will be devoted to manufacturing. Features will include a complete dispensing and conveying system for the preliminary processing of various raw materials.

Hewitt appointed Benjamin T. Moffatt as manager of the New York district, with Headquarters at 120 Broadway, New York, N. Y.

(*Continued on page* 71)

NEW ENGLAND

The Fisk Rubber Corp., Chicopee Falls, Mass., was dissolved at a special stockholders' meeting in Wilmington, Del., on March 12 by a vote of 344,208 to 100. Officers of the concern were instructed to turn over the remaining assets to the United States Rubber Co., New York, N. Y., which on December 29 purchased the properties and the business of the Massachusetts corporation.

Vultex Chemical Co., 666 Main St., Cambridge, Mass., according to Sales Manager K. B. Osborn, has moved its New York, N. Y., office from 125 Duane St. to 200 Church St.

Dewey & Almy Chemical Co., Cambridge B, Mass., recently purchased, for its new Chicago, Ill., plant, a 5½-acre lot in the township of Stickney. The first unit to be built will provide about 30,000 square feet of floor space, to be used for the manufacture of chemical engineered specialties for the can making and glass closure fields, although other Dewey & Almy specialties will be made later.

Delite Fabrics, Inc., manufacturer of elastic fabrics, Westerly, R. I., has, according to Alfred A. Gobeille, president and treasurer, purchased from a Providence syndicate the former property of the American Thread Co., Stonington, Conn., damaged in the hurricane in 1938. The plant, being repaired and rebuilt, will be occupied by Delite Fabrics, Inc., for manufacturing operations early in June.

Apex Tire, Inc., 505 Central Ave., Pawtucket, R. I., has entered into a stipulation with the Federal Trade Commission, Washington, D. C., to discontinue misleading representations in the sale of rebuilt automobile tires, including statements that it is the world's largest rebuilder of tires or America's largest quality tire rebuilder, until such are the facts established by competent evidence; that it is the pioneer of the tire rebuilding industry; that its tires are guaranteed against all road hazards, or are unconditionally guaranteed for six months, and that they are as safe or durable as new tires, or will save their owners 50 or nearly 50% of new tire costs, or will give the same trouble-free service as first-line new tires.

Rubber manufacturers in Rhode Island in February paid out in wages $313,959, 4.6% above the January figure and 1% above that of February, 1939. The number of employes in eight concerns was 4,274 in January, 1940; 4,232, December, 1939; and 4,092, January, 1939. Man-hours worked for the respective periods in six plants follow: 178,081; 180,650; and 161,732.

OHIO

Goodyear Activities

Harry J. Carroll, since 1926 traffic manager of the Goodyear Tire & Rubber Co., Akron, was recently surprised by a score of company officials, including P. W. Litchfield, president, and E. J. Thomas, executive vice president, who had assembled in the office of W. H. Fleming, manager of merchandise control. Mr. Carroll was congratulated on having completed on March 7 thirty years of service with the company.

Farm Essay Contest

Members of the Future Farmers of America, National 4-H Clubs, and vocational agriculture classes, who are high school boys residing on farms, are eligible for the 1940 national farm essay contest sponsored by Goodyear on "How Rubber Tires Have Changed Farm Equipment and Methods." Closing date is May 15, and winners will be announced early in July.

The ten grand prize winners will again be guests at the Canadian camp of P. W. Litchfield, Goodyear president, and enroute will visit Quinpletland, the Canadian National Exhibition in Toronto, and Niagara Falls. The school attended by the best essay writer will receive $100, and the 25 contestants immediately below the grand prize winners will each get $25.

Rubber Flooring for the *America*

The United States liner *America*, largest merchant ship ever constructed in this country, now being fitted at Newport News for service this spring, will feature approximately 125,000 square feet of Goodyear rubber tile and sheet flooring rubber, in 25 special to-order colors or graduated tones of conventional ones. Practically all public areas of the ship will be rubber covered. Thus the main promenade deck of 12,000 square feet is to be covered with special blue-green rubber in a new design. Instead of the customary smooth surface, each 28⅞-inch square block has its upper surface broken into 1⅛-inch squares by grooves cut to a depth of 3/32-inch, to increase foot traction and provide drainage to the scuppers.

This entire installation is believed by Goodyear to be the largest application of rubber ever made to an ocean liner.

William B. Lawson, formerly of The Harshaw Chemical Co., Cleveland, has organized W. B. Lawson, Inc., Union Commerce Bldg., Cleveland, to deal in industrial chemicals, oils, and non-ferrous metals.

Harry F. Webster, vice president, Denman Tire & Rubber Co., Warren, O., recently was elected president of the Warren Chamber of Commerce. Mr. Webster, who has been very active in the organization for several years, succeeds B. N. MacGregor.

Goodrich Announcements

The B. F. Goodrich Co., Akron, on March 15 redeemed out of sinking fund moneys, through its corporate trustee, the Bankers Trust Co., New York, N. Y., $190,000 principal amount of first mortgage bonds, 4¼% series due 1956. The holders of the 190 bonds selected in redeeming them received the principal amount, a premium of 3% of this amount, and accrued interest to March 15, 1940.

Vice Preident T. G. Graham has announced that last month Goodrich began erection of a one-story factory building in its reclaiming division. The company also has under construction an additon to the chemical plant, to cost $65,000, which will house equipment valued at $100,000.

The Goodrich engineering division held its annual safety dinner, attended by 125, on February 29 at Welch's Tavern, Akron, at which Frank Brown was toastmaster. The speakers included H. E. Cook, general superintendent of the division; Walter P. Schneider, safety engineer; W. P. Sheehy, M. D. Griffiths, and D. Straiton, chief of plant protection.

New Appointments

Several changes have been reported by G. E. Brunner, general manager of the Goodrich automotive tire sales division. Walter W. Thomen is now manager of automotive tire sales of the Chicago division, which includes Milwaukee and Minneapolis, with headquarters in Chicago. E. F. Tomlinson, in charge of the manufacturers' sales office in Milwaukee, has been named Akron representative on special farm service tire work, with headquarters in Chicago. W. W. Scull, in the purchasing department in Akron, has been made Chicago manufacturers' sales representative, together with A. B. Droeger; and A. B. Goering has been named representative in the newly created Minneapolis division of manufacturers' sales.

Research Credited for Belting Gain

The sharp gain in the rubber industry's share of the important market for transmission and conveyer belting is due to industrial research, believes Paul W. Van Orden, manager of the Goodrich belting division. The Census of Manufactures showed sales of rubber and leather belting in 1929 at $25,776,000 and $25,624,000 respectively, but for 1937 (the latest available census report) the respective figures were $32,060,000 and $14,715,000. Though volume of each dropped more than half during early years of the depression, rubber belting has made a strong comeback since 1933, with sales last year estimated by Mr. Van Orden at more than $35,000,000.

Research has accomplished such innovations as troughs in conveyer belts which drain off and save valuable fruit and vegetable juices that once were wasted in canneries. A great improvement in conveyer belts has been wrought by the adaptation of weftless tire cord to construction of conveyer belts. Another significant factor in the belting business is the change from "all-over" power transmission in factories, with all machines motivated by belted power from a central source, to individual electric motors using rubber transmission V-belts, which also have undergone great improvement in the research laboratory.

It is estimated that 150,000 different manufactured products today move through factories on conveyer belts.

Heartened by the technical progress made with belting in the last decade, engineers are now considering possible belting markets in entirely new fields, for instance, the mass movement of persons, with conveyers carrying them from railroad stations to hotels, from crowded subway, trolley, and bus stations to street exits, stores, etc.

C. W. Seiberling, first vice president of the Seiberling Rubber Co., Akron, recently was awarded a plaque by the Lions Club of Akron honoring him as "the city's No. 1 citizen—a voice that will never die in this community."

The Swan Rubber Co., manufacturer of molded and tube machine products, Bucyrus, according to President M. G. Nussbaum, has purchased the plant in Carey, formerly occupied by the Carey Rubber Co., comprising approximately 33,000 square feet of floor space, which will be devoted to the production of brake lining, friction materials, and refrigerator insulating parts, but no rubber products. Production in the new building will start within three months when the department devoted to the above products will be moved from the Bucyrus plant and expanded.

Wm. O'Neil, president, General Tire & Rubber Co., Akron, recently completed a two-month business tour of the United States and Mexico. Mr. O'Neil believes the business outlook is better and conditions will improve during the spring and summer. He further stated that so far 1940 has been a better tire year than '39, which was the best in a decade.

The Firestone Tire & Rubber Co., Akron, has perfected a revolutionary new spark plug utilizing electrodes containing polonium. The alpha rays emitted by the polonium electrodes ionize the surrounding air to maintain it in a condition conducive to instant sparking.

L. R. Jackson, vice president in charge of sales for Firestone, has announced the appointment of H. D. Tompkins as sales manager with headquarters at Akron. Mr. Tompkins joined Firestone 21 years ago, serving in various sales capacities; in 1935 he became sales manager of the Firestone company in California. C. M. Barnes, for several years Mr. Tompkins' assistant and recently zone manager for the southwest territory, succeeds him in California.

MIDWEST

U. S. Rubber Absorbs Gillette Rubber Co.

At a special meeting, February 29, stockholders of the Gillette Rubber Co., Eau Claire, Wis., approved the company's absorption by the United States Rubber Co., New York, N. Y., for many years a majority holder of Gillette stock. Dissolution of the Gillette Rubber Co. was voted at the same meeting. Gillette was organized in 1917 and on March 31, 1940, ceased to exist as a separate corporation.

U. S. Rubber, holder of 93% of the Gillette stock at the time of the meeting, agreed to pay $29 per share to minority stockholders, this offer to hold good until March 29, after which liquidation value would be paid. Final liquidation must be accomplished by Dec. 31, 1940. All liabilities of the Eau Claire company, estimated at $4,315,000 and including a 5% first mortgage bond issue outstanding of $850,000 due January 1, 1955, are to be paid by the U. S. Rubber Co.

In 1939, Gillette earned $901,000, or $4.50 per share, and during the last five years its earnings averaged approximately $2.75 per share. Merger of the two companies is expected to bring about economies in operation and will avoid duplication of corporation taxes.

U. S. Rubber will operate the Eau Claire plant for the production of automobile and bicycle tires, and the Gillette brand is to be continued with increased facilities. The power house is now being remodeled at a cost of $135,000, and recently factory additions at an expense of $110,000 were completed. It is understood that the Gillette executives and factory personnel will continue their former duties.

The Pioneer Asphalt Co., Chicago, Ill., has announced that Louis Garbi, who joined the company in 1910 as sales engineer and resigned some time after, has returned to the organization. Pioneer Asphalt also reports the recent completion of a large asphalt refinery at Chicago by its parent company, Wishnick-Tumpeer, Inc.

The Gates Rubber Co., manufacturer of hard rubber goods, mechanicals, tires and tubes, and tire accessories and repair materials, Denver, Colo., according to Lee Witzenburg, assistant manager of the industrial division, has moved the following offices to new and larger quarters: St. Louis, Mo., to 2701 Olive St.; Houston, Tex., to 110 Milby St.; and Los Angeles, Calif., to 2240 E. Washington Blvd. The engineering staffs at all three offices as well as at most other branches have been materially increased, and the firm feels that improved business conditions and the general outlook for 1940 well warrant this expansion in its sales staff.

(Continued on next page)

CANADA

Canada's imports of crude rubber in January totaled 11,259,546 pounds, value $2,263,930, against 6,775,497 pounds, value $1,250,759, in December.

Canada's January exports of rubber goods amounted to $1,652,021, against $1,035,944 in December and $1,346,480 in January, 1939, according to the Dominion Bureau of Statistics. Of the total, $643,000 went to the United Kingdom. Exports of rubber boots and shoes were $754,874, against $254,302 in December and $352,322 in January, 1939. Tire exports were $636,529, against $578,765 in December and $716,811, in January, 1939.

Dominion Rubber Co., Ltd., Montreal, P.Q., has announced two new appointments. George B. Rutherford, formerly manager of special products sales, has been made assistant general manager, mechanical rubber goods and sundries sales; while R. B. Marr, director of development for mechanical rubber goods and footwear for the past decade has been named assistant general manager of manufacturing, mechanical rubber goods division.

War Supply Board, Ottawa, Ont., in recent lists of contracts awarded included the following: *rubber goods for mechanical transport:* Firestone Tire & Rubber Co. of Canada, Ltd., Hamilton, Ont., $508,948, Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont., $446,835, Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., $204,561; *rubber clothing:* B. F. Goodrich Rubber Co. of Canada, Ltd., Kitchener, Ont., $18,662, Gutta Percha & Rubber, Ltd., Toronto, $17,954.

Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont., has named to the board P. B. Yancey and J. L. Graham, succeeding Winthrop Brainerd and John L. Collyer. James L. Simpson, president and general manager, in his annual report to stockholders declared that as automobile production for 1939 again declined, demand for original equipment tires was adversely affected, but replacement sales were greater. Mechanicals sales were well maintained, influenced by larger grain crops and improved pulp and paper business. Canadian Lastex, Ltd., in which Dunlop is interested, showed considerable improvement in sales volume and also in operating profit. Earnings took care of debenture interest and arrears of the sinking fund, but no common dividend has so far been declared. As working capital exceeded immediate requirements, Canadian Lastex, Ltd., purchased a further $86,000 of its debentures from Dunlop, which, December 31, held 50% of the common stock and $114,000 of the 7% debentures. The amount of debentures issued and originally held by Dunlop was $350,000.

LEGAL

Government Loses Civil Suit Against Tire Companies

Judge Edward A. Conger, of the United States District Court for the Southern District of New York, on March 5 dismissed a civil suit filed on February 20, 1939, by the Department of Justice on behalf of the United States Federal Government to recover triple damages, $1,053,474.63, against eighteen tire manufacturers. The judge sustained the contention of the defendants that the federal government could not sue for triple damages under Section 7 of the Sherman Anti-Trust Act because the government is not a "person" as defined in the act. Judge Conger mentioned, however, that the United States had recourses, under the law, to injunction or criminal proceedings. The complaint charged a conspiracy to fix the price of tires on sales to the government, in alleged violation of the Sherman Anti-Trust Act. Defendants named in the suit were: Cooper Corp., Findlay, O.; Dayton Rubber Mfg. Co., Dayton, O.; Dunlop Tire & Rubber Corp., Buffalo, N. Y.; Falls Tire & Rubber Co., Findlay; Firestone Tire & Rubber Co., Akron, O.; Fisk Rubber Corp., Chicopee Falls, Mass.; General Tire & Rubber Co., The B. F. Goodrich Co., and Goodyear Tire & Rubber Co., all of Akron; Kelly-Springfield Tire Co., Cumberland, Md.; Lee Tire & Rubber Co., Conshohocken, Pa.; Mohawk Rubber Co., Akron; Norwalk Tire & Rubber Co., Norwalk, Conn.; Pennsylvania Rubber Co. of America, Inc., Jeannette, Pa.; F. G. Schenuit Rubber Co., 1200 Mt. Royal Ave., Baltimore, Md.; Seiberling Rubber Co., Akron, and United States Rubber Products, Inc., and United States Tire Dealers Corp., both of 1790 Broadway, New York, N. Y.

The above ruling is the first of its kind ever made against the federal government. Because of its original and fundamental importance, the government is expected to request the Supreme Court to review Judge Conger's decision.

Adjudicated Patent

(C. C. A. Tenn.) Hanson patent, No. 1,970,698, for portable repair vulcanizer, *Held* invalid. *Shaler Co.* v. *Rite-Way Products,* 107 F. (2d) 82.

Adverse Decision in Interference

In interferences involving the indicated claims of the following patent final decision has been rendered that the named patentee was not the first inventor with respect to the claims that are listed.

Pat. 2,068,456, E. J. Hooper, Elastic ventilated fabric, decided December 9, 1939, claims 1 and 2.

OBITUARY

B. D. Porritt

AFTER a long period of ill health Benjamin Dawson Porritt, director of research, Research Association of British Rubber Manufacturers, Croydon, Surrey, England, died at his home there on January 28. Born at Turtle Mountain, Manitoba, Canada, January 26, 1884, he was educated at Whitgift Grammar School, Croydon, University College, London, University College Medical School and Heriot Watt College, Edinburgh. In 1908 the deceased joined the North British Rubber Co., Ltd., Edinburgh, as chemist, becoming works superintendent in 1910, chief chemist in 1912, and research superintendent in 1916. He became associated with the R. A. B. R. M. in 1920.

Mr. Porritt was also a Fellow of the Institute of Chemistry, of the Institute of Physics, and of the Royal Society of Edinburgh and was very active in the affairs of the Institute of Chemistry, the Chemical Society, Institution of the Rubber Industry, and Rubber Growers' Association. In 1938 he was awarded the (I. R. I.) Colwyn Medal. Besides he wrote many articles and books of interest to the rubber industry and took out several patents.

Mr. Porritt was married and had two daughters.

The funeral was held on January 31 at Croydon Crematorium.

G. L. Moore

FOLLOWING an operation, Geoffrey Louis Moore, vice president and director, George C. Moore Co., manufacturer of elastic webbing, Westerly, R. I., died on February 25. He was born in Middletown, Conn., on September 18, 1898, and later attended Westerly High School, which he left in his senior year to join the army. During the World War he was a lieutenant in the aviation service. Returning to civilian life, Mr. Moore studied at Worcester Academy and Lowell Textile Institute. Then he joined his father's company as vice president and director.

The deceased belonged to Westerly, Watch Hill, Misquamicut, and Thames yacht clubs, and Winnepeg Hills Golf and Tuna clubs.

He is survived by his mother, his wife, three daughters, six brothers, and two sisters.

Richard W. Manthorp

A HEART attack caused the death, on February 19, of Richard W. Manthorp, for the past two decades an expert in the crude rubber department of the United States Rubber Co., New York, N. Y. He was born in San Francisco sixty years ago and educated there. Survivors include the widow and a daughter.

John Stauffer

FOLLOWING a short illness, John Stauffer died in San Francisco, Calif., on March 4. Born in Kaiserslautern, Germany, 78 years ago, the deceased went to San Francisco in 1885 and became interested in the development of many chemicals necessary to early California industry, pioneering in the production of carbon bisulphide and sublimed sulphur. He was one of the founders of the San Francisco Sulphur Co. (1894); Wheeler, Reynolds & Stauffer; Stauffer Chemical Co. (1895); and American Cream Tartar Co. (1899), all of San Francisco. Through the Stauffer Chemical Co., John Stauffer was an organizer of several other chemical companies and of the Pacific Hard Rubber Co. and Western Molded Products Co., both of Los Angeles, Calif., and in both of which Stauffer Chemical holds a controlling interest.

Surviving are his wife, two daughters, a son, John, Jr., who is a vice president of the company and manager of the Los Angeles division, and a nephew, Hans, attached to the New York office.

Wm. E. Crofut

WILLIAM E. CROFUT, president of The Forest City Rubber Co., Cleveland, O., which he had founded in October, 1905, died at his home in Cleveland Heights on March 8. From 1900 to 1905 he had served as treasurer and a director of the Ohio Rubber Co., Cleveland.

Born in Syracuse, N. Y., on September 5, 1874, Mr. Crofut later attended Syracuse University, but did not graduate. He then joined the just-starting *Syracuse Post Standard* and within five years became its city editor.

The deceased was fond of sports, widely traveled, and active in civic affairs. He was a director of the Y. M. C. A., a member of the St. Luke's Hospital Association, and a former director of the Chamber of Commerce and of the Cleveland Credit Men's Association. His clubs included Union, Mayfield, Canadian Campfire, and Aintree Country. During the World War he served as a non-commissioned officer on the war council of the American Red Cross.

He leaves his wife, a son, a daughter, three stepdaughters, a stepson, and a sister.

Private services and burial in Lake View Cemetery took place on March 11.

Thomas L. Robinson

WORD was recently received from Switzerland of the death in Zurich of Thomas Linton Robinson, one-time president of the Republic Rubber Co., Youngstown, O., who later became prominent as a New York banker. He was born in Ravenna, O., June 28, 1880, and educated at Western Reserve Academy and the University of Michigan. He then engaged in the practice of law and later entered the banking business. In 1910 Mr. Robinson became a director of Republic Rubber and the next year was elected president. He resigned in 1917, continuing, however, as chairman of the board and in charge of the financial management of the firm.

During his lifetime the deceased was connected with many other business organizations, clubs, and fraternities. He also served as a major in the World War, a commissioner of the American Red Cross, an assistant member of the Dawes commissions, vice chairman of the emergency unemployment relief commission in New York, and deputy administrator of the finance codes under the NRA.

E. B. Barnes

EARL B. BARNES, for the past six years foreman at the Anaconda Wire & Cable Co., Pawtucket, R. I., died February 29 after a brief illness. He was born at Marion, Ind., where burial took place. He is survived by his wife, two daughters, and three sisters.

Eastern and Southern

(*Continued from page* 68)

Jos. Stokes Rubber Co. finds business far better than this time last year; while the **Luzerne Rubber Co.**, both of Trenton, N. J., also reports increased output in hard rubber articles.

Puritan Rubber Co., is experiencing better conditions in some lines, and **Pierce-Roberts Rubber Co.**, manufacturer of druggists' sundries, both of Trenton, N. J., has added another shift following increased orders.

Crown Cork & Seal Co., Inc., Baltimore, Md., through its trustee, Bankers Trust Co., New York, N. Y., is redeeming, on April 1, out of its sinking fund 75 of its $1,000 Ten-Year 4½% Sinking Fund Debentures due July 1, 1948. The principal amount plus accrued interest to April 1, 1940, will be paid.

Midwest

(*Continued from page* 70)

La Crosse Rubber Mills Co., La Crosse, Wis., has announced the resignation as general manager of Arthur S. Funk, who will, however, continue as a director and treasurer of the company, which he joined in 1909. He is succeeded by his assistant, Leo J. Larkin, who is also secretary of the firm. Other officers include Albert P. Funk, president, and Wm. F. Funk, vice president.

Robert E. Clayton, superintendent, Servus Rubber Co., Rock Island, Ill., on March 7 discussed before a luncheon meeting of the East Moline (Ill.) Rotarians the history and development of rubber.

FROM OUR COLUMNS

50 Years Ago—April, 1890

In making seams for rubber coats, in any sort of cemented work, camphene is as far ahead of benzine as Para rubber is ahead of African flake. (p. 168)

A new scheme in the West is the renting of fire hose to those towns that are too impecunious to buy it outright. (p. 168)

Efforts are now being made to discover means for preserving the milk (latex) and shipping it in the fluid state. (p. 173)

An ingenious experimenter has a process for covering wires with spun glass. The manufacture of flexible glass is one of the lost arts, and if it should ever be rediscovered, no doubt glass-insulated wires would come into use. (p. 179)

The old buildings of the Boston Drug Co. (Boston, Mass.) were at the lower end of Commonwealth Ave., and it was in those buildings that the Pierce Rubber Mills were first started and the first rubber shoddy was made in a commercial way. (p. 183)

The National India Rubber Co. claim the largest single plant, and the greatest variety of products of any establishment in the country. (p. 184)

25 Years Ago—April, 1915

The Rubber Growers' Association, of London, was formed in June, 1907. Mr. H. K. Rutherford was elected the first chairman of the association, which started with a membership of 60, representing 23,000 cultivated acres. (p. 376)

In recent years a number of northern plants of the milkweed family and other latex-bearing varieties have been investigated by various American chemists. (p. 379)

The increase over last year of about $4,850,000 in plants and properties of the United States Rubber Co. includes an expenditure during the year of about $2,100,000 on the company's rubber plantations in Sumatra. (p. 390)

Records of sales by the Goodyear Tire & Rubber Co., show that the straight side tire is making a great gain in popularity over the clincher type, sales of the former amounting to about 65% of the total in 1914, while the present season shows about 83% of the new cars using this straight side type of tire. (p. 399)

Rubber air brake hose may make possible the saving of more than a million dollars a year for the railroad companies operating in N. J. (p. 404)

A year or more ago tire manufacturers were timid about acknowledging the use of any plantation rubber. (p. 411)

Those who use aniline oil as an accelerator are bidding as high as $1.75 per pound. (p. 416)

FINANCIAL

Unless otherwise stated, the results of operations of the following companies are after deductions for operating expenses, normal federal income taxes, depreciation, and other charges, but before provision for federal surtax on undistributed earnings. Most of the figures are subject to final adjustments.

American Cyanamid Co., New York, N. Y. For 1939: net income, $5,524,940 after charges and taxes, equal, after preferred dividend requirements, to $2.07 each on the 2,618,367 combined Class A and Class B shares outstanding, against $2,452,911, or 91¢ a share in 1938; shows current assets, $39,445,229, current liabilities, $9,040,125, against $33,658,471 and $5,513,595, respectively.

American Hard Rubber Co., New York, N. Y. For 1939: net profit, $386,123, equal, after dividend requirements on 8% cumulative preferred stock, to $3.12 each on 65,503 shares of $50 par common stock, against $47,555, or $2.09 each on 22,682 shares of 8% preferred in 1938.

American Zinc, Lead & Smelting Co., Columbus, O., and subsidiaries. For 1939: net profit, $319,632, equal to $4.70 each on 67,953 shares of $5 prior preferred stock against net loss of $53,268 in 1938.

Columbian Carbon Co., New York, N. Y., and subsidiaries. For 1939: net profit, $2,857,103 after depreciation, depletion, loss on disposed fixed assets, federal income taxes, minority interest, and other charges, equal to $5.32 each on the 537,406 shares of no-par capital stock, excluding 1,014 treasury shares, against $2,757,540, or $5.13 a share, in 1938; consolidated current assets, including cash and marketable securities of $4,142,026, $7,823,905, current liabilities, $1,630,410, contracted with current assets of $6,219,419, including cash and marketable securities of $3,221,885, and current liabilities of $1,047,019.

The B. F. Goodrich Co., Akron, O., and subsidiaries. For 1939: net income, $6,628,746, equal, after all charges including taxes and provision for preferred dividends, to $3.50 each on the 1,303,255 shares of common outstanding, against $2,240,119, or 14¢ a share, in 1938; sales, $135,735,562, against $109,439,262; current assets, $74,263,793, including cash of $11,345,261; current liabilities, $11,006,156; inventories, $37,239,383. Certain subsidiaries in the belligerent European countries, representing an investment of $1,519,463 and showing a small profit for the year, were not included in the 1939 report.

Monsanto Chemical Co., St. Louis, Mo. For 1939: net income, $5,546,416, equal, after all charges including allowance for preferred dividends, to $4.01 a common share, against $3,290,519, or $2.35 a share in 1938; current assets, $20,776,394, against $19,320,283; current liabilities, $5,968,164, against $4,512,242; inventories, $9,286,008, against $9,171,998.

Mount Vernon-Woodberry Mills, Inc., Baltimore, Md. For 1939: net profit, $335,998, equal to $5.84 each on 57,535 shares of 7% preferred stock on which accumulated, unpaid dividends amounted to $71 a share, a net loss of $159,138 in 1938.

National Rubber Machinery Co., Akron, O. For 1939: net income, $102,331, equal to 66¢ each on 154,000 common shares, against $47,062, or 31¢ a share, in 1938.

Dividends Declared

Company	Stock	Rate	Payable	Stock of Record
American Hard Rubber Co.	8% Pfd.	$2.00 q.	Mar. 30	Mar. 19
Boston Woven Hose & Rubber Co.	Com.	$0.50 irreg.	Mar. 15	Mar. 1
Boston Woven Hose & Rubber Co.	Com.	$0.50	Mar. 15	Mar. 1
Detroit Gasket & Mfg. Co.	Com.	$0.25	Apr. 20	Apr. 5
Dominion Textile, Ltd.	Com.	$1.25 q.	Apr. 1	Mar. 15
Endicott Johnson Corp.	Com.	$0.75	Apr. 1	Mar. 21
Endicott Johnson Corp.	Pfd.	$1.25 q.	Apr. 1	Mar. 21
Firestone Tire & Rubber Co.	Com.	$0.25	Apr. 20	Apr. 5
Fisk Rubber Corp. (Liquidating)*	....	....	.....	Apr. 2
Garlock Packing Co.	Com.	$0.50	Mar. 30	Mar. 23
General Electric Co.	Com.	$0.35	Apr. 25	Mar. 15
B. F. Goodrich Co.	Cum. Pfd.	$1.25 q.	Mar. 30	Mar. 22
Goodyear Tire & Rubber Co.	Pfd.	$0.625 q.		
Goodyear Tire & Rubber Co. of Canada, Ltd.			Apr. 1	Mar. 15
	Com.	$0.62 q.	Apr. 1	Mar. 15
Hercules Powder Co.	Com.	$0.60 irreg.	Mar. 25	Mar. 14
Jenkins Bros.	7% Pfd.	$1.75 q.	Mar. 29	Mar. 14
Jenkins Bros.	Fd. Sh.	$1.00	Mar. 29	Mar. 14
Jenkins Bros.	N.V. Com.	$0.25	Mar. 29	Mar. 14
Mansfield Tire & Rubber Co.	Com.	$0.25	Mar. 20	Mar. 9
Mansfield Tire & Rubber Co.	6% Pfd.	$0.30	Apr. 1	Mar. 15
Midwest Rubber Reclaiming Co.	Pfd.	$1.00	Mar. 1	Feb. 20
Rome Cable Corp.	Com.	$0.10	Mar. 29	Mar. 14
United States Rubber Co.	1st Pfd.	$2.00	Mar. 22	Mar. 8

*Initial liquidating distribution of one-quarter of a share of common stock of United States Rubber Co. and $6 in cash, payable upon surrender of certificates on or after April 2, 1940.

EUROPE

GERMANY

Achema IX Cancelled

After careful consideration the Dechema, German Society for Chemical Apparatus, has decided to cancel the 1940 Achema IX, Exhibition of Chemical Apparatus. Instead a Congress-Exhibition, "Materials and Chemistry," will be held in Breslau, starting July 28, in connection with the National Convention of German Chemists, July 30 to August 3. The Congress-Exhibition will treat: materials for chemical apparatus, their selection, application, and manufacture (courses of lectures are planned), and testing apparatus and methods for these materials. New and important scientific apparatus and appliances will be discussed.

New Igelit Products

New forms of the vinylchloride polymerizates produced by the I. G. Farbenindustrie and known as Igelits are constantly being evolved. A recent development takes the form of transparent, colored sheets about 0.1 to 0.15-mm. thick, said to be fast to light and weather. They are apparently being widely used in the clothing industry in the manufacture of coats, capes, etc. Much heavier sheets made from Igelit MP have been on the market for some time now under the name Astralon. These are obtainable in a variety of colors, both transparent and opaque, and provide very effective wall paneling and surfaces for furniture as well as a variety of small goods. Astralon is weatherproof and incombustible.

The latest Igelit material is a rechlorinated polyvinylchloride, Igelit PeCe, readily soluble in solvents. From this product is spun a fiber called PeCesilk, said to have excellent properties for technical purposes. The fiber is thermoplastic, unaffected by water, has good resistance to acids, alkalis, and other corrosive chemicals in any concentration; will not rot, is non-inflammable, highly elastic in comparison with other fibers, and has highest heat- and electrical-insulating powers, it is claimed.

Puncture-Proof Plane Fuel Tank

Press reports reveal the widespread use the Germans have made of self-sealing, puncture-proof airplane fuel tanks. A Nazi bomber that fell into enemy hands last fall had more than thirty bullet holes in its gasoline tank, but two days after its crash landing eighty gallons of fuel still remained in the tank. The latter consisted of a thin fiber case braced with ribs and surrounded by layers of crude rubber and duckskin which swelled when punctured, thus closing the bullet holes. It is further reported the Allies are adopting similar safeguards for fuel tanks.

Synthetics in Cable Making

C. Breitenstein recently discussed[1] the progress in the use of synthetics for making cables for the navy. The desire to reduce cable weight led to first attempts at substituting synthetics for the usual lead covers, and even in 1935 the navy issued specifications for such cable covers. The earliest of the new covers were chiefly of the thermoplasts Plexigum or Igelit, but though apparently satisfactory at first, they soon proved unable to withstand the strenuous conditions on board ship. If the covers were not softened by the heat so that the wires tended to wear through, they became hard and brittle because of loss of the softeners with which they were compounded; while under especially severe thermal conditions chemical decomposition even set in. Consequently experiments were begun in 1937 with Buna for cable covers, and the so-called MK cables were developed, which showed a 28 to 60% saving in weight compared with lead-covered cables and depending on the type of cable.

For MK cables the individual conductors were insulated and twisted as usual; then cordlike layers of a plastic were inserted in the spaces between the wires to improve water-tightness, and the whole provided with a synthetic cover on the forcing machine. Over this four layers of tape, thin plastic sheet or paper, were wrapped, and finally an outer cover of braided iron wire. Before the war such cables were also exported although manufacturers kept the composition of the covers secret.

Until quite recently the conducting wires were protected by the usual natural rubber insulation, as specified by the navy. But owing to the shortage of natural rubber caused by war conditions, it has become necessary to insulate the wires also with Buna S; usually a very small amount of natural rubber is mixed with the Buna. Eventually it is expected to use Buna SS (Levulkan).

While Buna S is at least equal to natural rubber as far as aging is concerned and has better heat resistance, certain difficulties are connected with its use as insulation for wires. Pure Buna S is not sufficiently adhesive to permit proper sealing of the seams, and to remedy this defect, some factories add Oppanol to the Buna, while others add natural rubber or reclaim. Again, to facilitate processing, both Buna S and Buna SS must undergo a certain preliminary degradation or decomposition, which may proceed differently according to manipulation in the factory, so that the properties of the final product may vary and cause difficulties, especially in cable works unaccustomed to handling these materials.

[1] "Synthetic Navy Cables." *Kunststoffe*, Feb., 1940, pp. 29-34.

The latest problem to engage German cable makers is that of still further reducing the size and the weight of cables by reducing diameter. It is realized that the thickness of the protective cover cannot safely undergo further reduction, but it is proposed to insulate the wires less heavily, and experiments are under way to use for wire insulation a few layers of very thin plastic sheet, topped with a layer of Buna 0.4 to 0.5 mm. thick. This method presents many difficulties which must first be overcome, but, if successful, it is calculated that the total diameter could be reduced from 12 to 33%, depending on the type of cable.

SOVIET RUSSIA

The Krasnie Bogatyr factory has conducted experiments using gutta percha to produce varnishes for rubber toys. The suitably compounded and colored solutions, it is claimed, give more elastic films than the usual enamel varnishes made with oils. Gutta-percha coated articles dry quickly so that much less drying space is required. Finally gutta-percha varnishes are said to age well and may be used on any kind of rubber.

Attempts have been made to use the rubber obtained from various indigenous plants. Thus tests have been initiated to determine the value of Kok-saghyz rubber for the manufacture of various articles including automobile tires and tubes. At the Central Laboratory of the Krasnie Treugolnik factory Kok-sagyz was used for tires and tubes; analysis of the rubber used for this purpose gave the following results: moisture, 0.50%; ash, 2.57%; acetone extract, 8.30%; chloroform extract, 82.96%; insoluble in acetone and chloroform, 5.67%.

In the manufacture of tires the usual formulas for smoked sheet compounds were suitably modified to take into account the special properties of the Kok-saghyz rubber. Thus stearic acid and aldol-alpha-naphthylamine were added to all mixes; the aldol-alpha-naphthylamine also was used in place of Neozone since the latter has a tendency to bloom in articles made from Kok-saghyz rubber.

All rubbers, whether prepared under laboratory or factory conditions, showed very good vulcanization characteristics and adequate resistance to rupture and they did not scorch when boiled in water for 30 to 40 minutes. But all showed higher plasticity than imported natural rubber when plasticized for 40 minutes. The latter characteristic caused some difficulty, particularly in the manufacture of inner tubes on cores. On the whole, the physico-mechanical properties of tires and tubes made from this rubber did not differ much from those made of imported rubber, it is claimed.

GREAT BRITAIN

Applying Latex to Wool

For some time Dr. C. M. Blow has done research work on applying latex to wool, for the British Rubber Producers' Research Association and the Wool Industries Research Association, and at a recent joint meeting of the Leicester Section of the Institution of the Rubber Industry and the Leicester Textile Society, he read a paper on "The Application of Rubber to Textiles" in which he mentioned this work. He stated that while larger proportions of rubber deposited on wool produced a harsh feel due to surface drag, properties of wool can be improved by small applications of rubber. The abrasion resistance of wool especially is improved by treatment with latex; carpets of such wool shed less; while garments wear longer and retain their shape better. More compact felts can be obtained with such wool; while felt-like materials can be prepared from latex-treated jute and cotton. The deposited rubber has satisfactory aging properties.

The method of application consists in passing the wool through a bath of suitably prepared dilute latex, when the rubber particles are deposited on the wool fibers, leaving a clear aqueous solution in the bath. The coating is uniform, and the amount of rubber deposited easily controlled; no subsequent gumming together of the wool threads occurs. As both the rubber particles in the latex and the wool fibers are negatively charged, cationic soap must be introduced into the latex to reverse the charge of the rubber particles.

The process can be applied to wool in hank, cheese, fabric, or carded form, and also to other textiles.

In the discussion following the paper it was brought out that the latex treatment did not change the hygroscopic properties of the wool; it would not prevent "runs" in hosiery, or did it impart waterproofing properties. As to the latter, Dr. Blow said it had been found possible to waterproof by depositing wax simultaneously with rubber.

Dunlop's Training Plan

The disorganization caused by war will involve certain sections of the population more than others. Recently Lord Derby emphasized the need of directing the energies of youths who have just left school, are not yet of military age, and are more or less at loose ends, urging that suitable employment be found for them.

In consequence the Dunlop Rubber Co. is offering scholarships providing free commercial training under expert supervision and a maintenance grant of £52 a year, to be paid weekly. The qualifications for preliminary consideration are: age from 17½ to 19 years at the commencement of the course, an educational standard equivalent to that of matriculation, sound health, and British nationality. The length of instruction, to vary in accordance with the age of the individual, will be so arranged as to permit him to report for military duty at the proper time. Most of the training will be at Fort Dunlop, and as far as practicable at the Dunlop depot nearest the pupil's home; short periods at Dunlop branches in other cities will be necessary. Training may be given at the Dunlop sales and service depots in Aberdeen, Birmingham, Bristol, Cardiff, Edinburgh, Glasgow, Leeds, Liverpool, London, Manchester, Newcastle-on-Tyne, Norwich, Nottingham, Plymouth, Southampton.

The training will include a course of instruction calculated to provide adequate technical background, a knowledge of the company's products, stock-recording, shipping, sales accounting, selling, advertising, etc.

Maintaining Exports

Lately the importance to Britain of maintaining her position of exporter, especially in time of war has been stressed repeatedly. That the British business men fully understand this problem and intend to hold their markets and even expand where possible is evident from the various bodies being just formed that are concerned with promoting exports. Recently the Secretary of the Department of Overseas Trade, the Rt. Hon. R. S. Hudson, M.P., appointed a committee to establish closer contact with the exporting industries and as a channel for the investigation of difficulties and the encouragement of effort in this trade.

The newly formed Federation of Manufacturers & Producers of Great Britain, has as its main object insuring a proper share of war work to smaller manufacturers, but export markets will also receive attention, particularly those neutral countries which formerly obtained various smaller articles from Germany. To aid interested members the federation will deal with all questions regarding raw materials, export licenses, and shipping arrangements, besides securing export business.

Finally the Chamber of Commerce in Edinburgh has set up a special export committee to explore overseas trade in its bearing on the city's industries. Among others, the local waterproof clothing manufacturers are greatly interested in these efforts.

FINLAND

In 1938, Finland imported 1,513,402 kilos of rubber goods, value 58,538,962 Finmarks. Included were hard rubber combs and other hard rubber goods, 14,935 kilos, value 1,768,208 Finmarks. Automobile tires, which amounted to 836,133 kilos, value 26,695,121 Finmarks, accounted for almost half the total imports. Other imports included 252,252 kilos packing; 42,571 kilos belting; 31,141 kilos hose; 117,674 kilos cycle and motorcycle accessories; 119,832 kilos footwear; 2,709 kilos surgical goods.

Great Britain was the biggest supplier of rubber goods, chiefly hose, tires, and cycle accessories; closely followed by the United States, chiefly packing, belting, automobile tires. Germany provided most of the surgical, hard rubber, and unspecified soft rubber goods.

HOLLAND

In line with the wartime regulation in Holland of the distribution of various commodities including rubber and rubber goods, a National Bureau for Rubber has been established in Amsterdam. All enterprises dealing in rubber and rubber goods must be registered here, and no one is allowed to manufacture or otherwise work rubber without a permit from the director of this office.

FAR EAST

Changing Status of Rubber Countries

The changes that have taken place in the relative importance of the rubber growing countries since 1929, largely as a result of the present International Rubber Regulation Scheme, are brought out in a recent issue of the *Rubber News Letter*, of the U. S. Department of Commerce, which reveals that while the share in world rubber production of Netherland India, Indo-China, and Thailand has increased considerably in the period from 1929 to 1939, that of British and South American countries has declined. Malaya, which led in 1929 with 52.7% of world output, and still provided 45.9% in 1934, dropped to 36.6% in 1939; at the same time other British rubber-growing countries, which supplied 12.9% in 1929, decreased to 11.5% in 1939.

On the other hand Netherland India, which accounted for only 29.4% of total 1929 shipments, rose to 37.3% in 1934. The rubber regulation agreement caused a temporary loss in percentage, restored in 1939 when Netherland India was permitted to ship 37.4%, topping Malaya for the first time.

The most striking advances were made by Thailand and Indo-China, whose outputs, however, have hitherto hardly been touched by restriction. They supplied only 1.6% of total world production in 1929, but 10.8% in 1939.

While countries not in the agreement

produced 29,800 tons in 1929, of which 21,300 tons came from South America, the total for 1939 was 36,800 tons, of which South America shipped only 15,300 tons.

MALAYA

Rubber Export Figures

Crude rubber exports from Malaya during 1939 totaled 361,560 tons. The exportable allowance was 371,300 tons, but an excess of exports at the end of 1938 amounting to 11,381 tons, reduced net available export rights to 359,919 tons. Consequently 1939 ended with an over-export of 1,641 tons. The low December shipments of about 23,500 tons helped practically to wipe out the over-export.

Bata in Malaya

The Bata concern has for some time been operating in Malaya with a rubber shoe factory at Klang and a rubber estate at Kulai besides sales depots, main office, and a new leather shoe factory at Singapore; in all employing nearly 900 persons. Here too it is the custom of the firm to provide dormitories, food, and general living quarters in addition to facilities for tennis and other games.

Company News

The Wilkinson Process Rubber Co., Ltd., reported profits for 1939 at $99,574 (Straits currency), against $55,980 in 1938. The net amount brought forward was $17,801 so that the total available for distribution was $117,375. The company will declare a final dividend of 5%, bringing the total distribution to 10% for the year. It is further proposed to issue special bonus shares at the rate of one for every ten shares held. In this connection it may be noted that the company has a nominal capital of $1,343,297 in $1 shares, of which 232,063 have been fully paid up. The proposed bonus will use $23,207 worth of shares.

Lunas Rubber Estates, Ltd., Singapore, paid a 10% dividend on last year's working. To do this and maintain the reserve account, however, it was necessary to draw on the carry-forward, which was thus reduced by $9,000. The directors feel that in view of the increased quota and better prices, this move is justifiable. The company has continued its replanting program and now has replanted 299 acres.

Glenealy Plantations, Ltd., made net profit of $46,137 in the last business year. The carry-forward from the preceding year was $76,333, making a total of $122,470. The company is to pay a dividend of 7½% which will require $45,000, or practically all the profits for last year.

Rationing Coagulants

A new order to control supplies of coagulant in Malaya aims to insure as even a distribution as possible of present stocks and of all future shipments of formic and acetic acid arriving from abroad. Special permits are required for purchases of coagulant. Owners of estates of over 100 acres will be able to obtain supplies from their usual dealers, but they will not be allowed to buy more than two-weeks' supply at one time. Owners of holdings under 100 acres will receive coupons at the same time as the usual export coupons which will permit them to buy coagulant in small amounts (from five fluid ounces up) from the regional Agricultural Department's supplies.

Goodrich Exhibit

A rubber exhibition staged primarily to demonstrate the latest types of Goodrich tires with non-skid tread and blow-out protection was recently held in Singapore by The B. F. Goodrich Company and its local agent, Singapore Motors. The display was not confined to tires, but included a wide variety of Goodrich products, including an acid seal paint made with latex base, expected to find wide use on estates for coating latex containers and pails; Armorite, a strong and durable rubber compound that can be bonded to metal; upholstery material consisting of bristles treated with latex; synthetic rubber; surgical gloves; hot water bottles; belting; floor tiling; hose, etc.

NETHERLAND INDIA

Replanting Increasing

The report on native rubber in Netherland India for the first half of 1939 states that the export quota for the Outer Provinces was 78,273 tons, but that licenses were issued for 78,636 tons; the difference was due partly to rounding off of figures and partly to the issue of coupons to compensate for water content of rubber shipped wet. Actual exports for the period totaled 84,608 tons, an excess of 6,335 tons.

In the first restriction period natives hardly availed themselves of the permission to replant deteriorated rubber gardens, but recently propaganda for replanting was begun; consequently it is expected that more attention will be given to this matter by the natives. On the other hand great interest was shown in extending plantations. The revised provisions of the International Rubber Regulation Agreement permitting a certain amount of new planting allows natives to plant up to 34,416 hectares of new land in 1939 and 1940, and all of this has been allocated already. There has been much trading in planting coupons for which relatively high prices have been paid. From all of this it is deduced that the whole area permitted will probably be planted up before the end of 1940.

In this connection active propaganda is being made by the responsible officers to insure that as far as possible superior planting material is used by natives, and to further this end it was decided to offer natives illegitimate clonal seed and seed from thinned-out selection gardens at the reduced price of 1 cent and ½ cent each, respectively. The response from the natives has been good, and large quantities of the seed have already been ordered. The government, going a step further, has laid out a number of seed gardens in rubber districts from which natives may in the future obtain superior polyclone seed. These gardens cover 199 hectares and include the following clones: Av. 163 and 185, L.C.B. 510 and 1320, Tjirandji 1 and 16, Bd. 5, and Br. 1, some of the finest Dutch clones.

Exports

According to the Central Bureau of Statistics, exports from Netherland India last year totaled 369,235 tons; whereas permissible exports were 377,822 tons. At the end of November, 1939, Netherland India had over-exported by about 8,000 tons, but the low December shipments, especially by native producers in the Outer Provinces, more than wiped out the former excess.

Total rubber exports by estates in December, 1939, came to 17,762 tons and for the year, 186,662 tons. The quota for estate rubber was 189,800.

Exports of native rubber from the Outer Provinces in December, amounted to only 6,626 tons, against a quota of 19,910 tons. For 1939, native shipments were 182,573 tons; while the quota, less a carry-over of 138 tons, was 187,022 tons.

Coagulant Difficulties

While supplies of coagulant, chiefly formic acid, appear not much below normal, yet, in view of the possibility that more serious interference in shipments to Netherland India may occur to result in a really acute shortage, the government has decided to regulate distribution of available supplies. This is the more necessary as the increased quotas bring with them a greater demand for coagulant. In addition the government is also concerned to curb the use of alum and other unsuitable materials, especially by natives.

Efforts are being made to become self-sufficient as far as coagulant is concerned, and three large alcohol factories are reported to be seriously studying the possibility of producing acetic acid here. So far it appears experiments have yielded satisfactory results, and it is hoped that before long acetic acid will be produced in Java.

Editor's Book Table

NEW PUBLICATIONS

"Kalvan—The New Ultra Fine Calcium Carbonate for Rubber." R. T. Vanderbilt Co., 230 Park Ave., New York, N. Y. 16 pages. This pamphlet tells how best results may be obtained with Kalvan, the firm's new fine particle calcium pigment. The properties imparted by Kalvan—unusual tear resistance and resistance to flex-cracking—are presented, together with general compounding recommendations. Physical test data show how increased loadings of the pigment affect tensile strength, hardness, modulus, curing rate, and tear resistance. Other data cover: varying acceleration with Kalvan; flex-cracking resistance and tear resistance, Kalvan vs. Gilders whiting; and masterbatching. Kalvan is suggested for truck tire inner tubes, white sidewalls, boot uppers and soling, water bottles, bathing caps, toys, and adhesion to metal with Ty-Ply "R."

"El-Sixty—An Accelerator for Rubber Vulcanization." Monsanto Chemical Co., Rubber Service Department, Akron, O. 20 pages. The subject of this report is the accelerator **El-Sixty,** chemically known as di benzothiazyl dimethylthiol urea. The discussion is centered on the activation of El-Sixty by guanidines, thiurams, aldehyde amines, and inorganic lead compounds. Several pages are devoted to typical applications of El-Sixty acceleration, with compounding formulas presented for: tires, inner tubes, V-belts, mechanical goods, heels, soles, automotive strip, hose, tire repair stocks, and compression set stocks.

"Goodrich Products 1940—'Goods Destined for Service.'" The B. F. Goodrich Co., Akron, O. 24 pages. This illustrated booklet is designed to acquaint the reader with a few of the many products made by Goodrich. The products described illustrate the diversified fields of application for rubber products—in motor transportation, in the air, in industry, on the farm, in the home, and on the road.

"A Needed Curb on Federal Administrative Law." No. 35 in a Series of Booklet-Editorials by Allen W. Rucker in collaboration with N. W. Pickering, president, Farrell-Birmingham Co., Inc., Ansonia, Conn. 16 pages. The subject of this booklet, the Logan Bill (Senate 915), is held by the authors to represent the first genuine attempt to curb the mushroom growth of "administrative law" so irksome to individual enterprise and so dangerous to individual liberties. After pointing out the significance of this important bill, the authors urge its support by the entire nation.

"A Message from The Bristol Company about Instruments." The Bristol Co., Waterbury, Conn. This illustrated folder, marking the firm's fiftieth anniversary in the field of recording and automatic process-control instruments, briefly reviews the past and highlights Bristol products and services of today.

"Rubber Latex Compounding." Rubber Chemicals News Letter Enclosure, Report No. 40-1. Benton Dales and W. H. Ayscue. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. 56 pages. This bulletin is designed to provide a working background of salient information on latex: its history, properties, compounding, testing, manufacturing processes, and application. A number of formulas and a helpful subject index are included.

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Patents and Trade Marks

MACHINERY

United States

21,378. (Reissue.) **Extrusion Press.** J. H. Fridén, Maplewood, assignor to Sun Tube Corp., Hillside, both in N. J.

2,190,803. **Apparatus to Make Tire Bead Cores.** F. J. Shook, Akron, O., assignor to National Standard Co., Niles, Mich.

2,190,809. **Fabricator for Adhesive Tape.** C. B. Strauch, New York, N. Y., assigner to Minnesota Mining & Mfg. Co., St. Paul, Minn.

2,190,939. **Hydraulic System and Control.** W. Ernst, Mt. Gilead, O., assignor, by mesne assignments, to Hydraulic Press Corp., Inc., Wilmington, Del.

2,191,536. **Machine to Finish Valve Stems.** P. Michel, Brooklyn, N. Y., assignor to Scovill Mfg. Co., Waterbury, Conn.

2,191,646. **Insole Binding Applier.** T. J. Doyle, Lynn, Mass., assignor to United Shoe Machinery Corp., Borough of Flemington, N. J.

2,191,655. **Clicking Machine.** J. F. Hardy, Beverly, Mass., assignor to United Shoe Machinery Corp., Borough of Flemington, N. J.

2,191,779. **Feed Modifying Attachment** for Shoe Machines. T. E. Therriault, Manchester, N. H.

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2,191,829. **Extruder for Rubber Rope.** J. H. Johnson, Ontario, Canada, assignor to The K & W Rubber Corp., Delaware, O.

2,191,847. **Molding Machine.** A. C. and W. W. Collins, both of Birmingham, Ala.

2,191,882. **Plastic Extrusion Molding Machine.** W. Ernst and I. B. Lawyer, both of Mt. Gilead, O., assignors to Hydraulic Press Corp., Inc., Wilmington, Del.

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2,192,130. **Automatic Tire Slotter.** W. F. Errig, Philadelphia, and G. M. Pfundt, Churchville, assignors to Peco Mfg. Corp., Philadelphia, both in Pa.

2,192,233. **Inner Tube Tester.** A. E. Lookholder, La Grange, Ill.

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2,193,514. **Inner Tube Repairing Device.** L. Kendall, Evanston, Ill.

2,193,584. **Machine to Apply Adhesives to Textiles.** E. A. Ellis, Medford, Mass.

2,193,731. **Fabric Applying Apparatus.** P. Keller, Akron, O., assignor to Wingfoot Corp., Wilmington, Del.

United Kingdom

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509,925. **Hydraulic Presses.** E. Cannon.

510,480. **Apparatus and Methods for Frothing Latex.** Firestone Tire & Rubber Co., Ltd.

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511,350. **Roll Grinders.** J. E. Pollack. (Dayton Rubber Mfg. Co.)

511,789. **Molding Presses.** W. H. Smith.

511,993. **Hydraulic Presses.** E. W. Bliss Co.

512,883. **Elastic Fabric Knitting Machines.** G. Blackburn & Sons, Ltd., and E. J. Towers.

513,127. **Tire Building Apparatus.** Wingfoot Corp.

PROCESS

United States

21,342. (Reissue.) **Diaphragm.** J. T. Clark, Oak Park, Ill.

21,379. (Reissue.) **Aggregates of Carbon Black.** H. J. Glaxner, deceased, late of Monroe, La., by Columbian Carbon Co., New York, N. Y., assignee.

21,390. (Reissue.) **Agglomerated Carbon Black.** H. W. Grote, New York, N. Y., assignor to United Carbon Co., Inc., Baltimore, Md.

2,191,910. **Pebble-Surfaced Rubber Article.** (Latex.) J. J. Galligan, Providence, R. I., assignor, by mesne assignments, to United States Rubber Co., New York, N. Y.

2,192,071. **Soilproofing Tennis Balls.** J. B. Dickson, Northampton, and J. Herman, Chicopee, both in Mass., assignors, by mesne assignments to A. G. Spalding & Bros., Inc., a corporation of Del.

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Dominion of Canada

386,787. **Winding Golf Balls.** E. A. Bogoslowsky, assignee of B. Bogoslowsky, both of New York, N. Y., U. S. A.

386,813. **Carbon Black Granules.** H. W. Price, Borger, Tex., U. S. A.

386,947. **Colored Articles** from Hard Rubber Containing Arsenic Sulphide. American Hard Rubber Co., assignee of W. Hiemann, both of New York, N. Y., U. S. A.

387,073. **Electric Coil.** Bendix Aviation Corp., South Bend, Ind., U. S. A., assignee of J. Bohli, Soleure, Switzerland.

387,172. **Tire.** H. T. Auerbach, assignee of E. A. Grange, A. F. Kaptuller, and E. J. Schmidt, all of Chicago, Ill., U. S. A.

United Kingdom

509,196. **Latex Spraying.** F. F. Schwartz and M. A. Chavannes.

509,367. **Reenforcing Rubber Products.** Firestone Tire & Rubber Co., Ltd.

509,567. **Driving Belts.** Dortmunder Gummiwaren-Fabrik. W. Pahl Kommandit-Ges.

510,048. **Pneumatic Tires.** Y. Kurokawa.

510,498. **Expanded Rubber.** Expanded Rubber Co., Ltd. (Rubatex Products, Inc.)

510,859. **Sponge Rubber.** (Latex.) International Latex Processes, Ltd.

511,088. **Purification, Concentration, and Separation of Colloidal Dispersions by Electrophoresis.** Semperit Osterreichisch-Amerikanische Gummiwerke A.G.

511,104. **Insulating Tapes.** United States Rubber Products, Inc.

511,219. **Rubber Thread.** Soc. Internationale de Participations Industrielles et Commerciales Soc. Anon.

511,408. **Elastic Threads.** R. and J. Pickles.

CHEMICAL

United States

2,190,672. **Water Soluble Phenol-Aldehyde Resins.** V. E. Meharg, Bloomfield, N. J., assignor to Bakelite Corp., New York, N. Y.

2,190,922. **Comminuted Sulphur** Obtained by Emulsifying Molten Sulphur in Water. S. B. Heath and F. R. Minger, assignors to Dow Chemical Co., all of Midland, Mich.

2,191,056. **Plasticized Polyvinyl Chloride.** (Synthetic.) G. Wick, Bitterfeld, assignor to I. G. Farbenindustrie A.G., Frankfurt a.M., both in Germany.

2,191,263. **Metal Refrigerator Tray** Coated with Halogenated Rubber Compound. C. E. Waring, assignor to General Motors Corp., both of Dayton, O.

2,191,266. **Plasticizer**—Monothio-Carboxylic Acid. I. Williams, Woodstown, and C. C. Smith, Carneys Point, both in N. J., assignors to E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

2,191,580. **Electrical Insulation**—Heat-Treated Mixed Polymers of Acrylic Acid Ester and Acrylic Acid Nitrile. N. Nowak and H. Hofmeier, both of Berlin-Charlottenburg, and C. Tobis, Berlin-Oberschoneweide, all in Germany, assignors to General Electric Co., a corporation of N. Y.

2,191,581. **Electrical Insulation**—Heat-Treated Mixture Containing Heat-Hardenable Synthetic Resin and Mixed Polymers of Acrylic Ester and Acrylonitrile. P. Nowak and T. Triantaphyllides, both of Berlin-Charlottenburg, Germany, assignors to General Electric Co., a corporation of N. Y.

2,191,584. **Electrical Insulation**—Heat-Treated Polymerized Acrylic Compound. G. Pohler, Berlin-Schoneberg, Germany, assignor to General Electric Co., a corporation of N. Y.

2,191,656. **Accelerator**—R-S-NH-R_1, where R is an Arylene Thiazyl Group, and R_1 is from a Group Comprising Cyclohexyl, Benzyl, and Hexahydrobenzyl Radicals. M. W. Harman, Nitro, W. Va., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,191,657. **Preparation of Cyclohexyl- and Benzyl-Amino Mercapto-Benzothiazoles.** M.W. Harman, Nitro, W. Va., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,191,664. **Antioxidant**—Condensation Product of a Ketone and a Primary Para Amino Substituted Diaryl Thio Ether. J. R. Ingram, Nitro, W. Va., assignor to Monsanto Chemical Co., St. Louis, Mo.

2,191,748. **Vulcanized Chlorinated Rubber Mixture.** J. P. Baxter, Widnes, Lancaster, and L. T. Dod, Crosby, Liverpool, both in England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,192,318. **Positively Changed Dispersions** of a Halogen-2-Butadiene-1,3 Containing Gelatin or Casein. (Synthetic.) J. E. Kirby, assignor to E. I. du Pont de Nemours & Co., Inc., both in Wilmington, Del.

2,192,583. **Coating Composition**—Copolymer of a Vinyl Halide and a Vinyl Ester of a Lower Aliphatic Acid, Dissolved in a Nitroparaffin. C. Bogin, assignor to Commercial Solvents Corp., both of Terre Haute, Ind.

2,192,705. **Fluid Rubber Composition,** Containing a Water Insoluble Phthalocyanine Coloring Matter, for Colored Rubberized Fabrics. W. J. R. Evans and W. F. Smith, Blackley, England, assignors to Imperial Chemical Industries, Ltd., a corporation of Great Britain.

2,193,613 and 2,193,614. **Plasticizers for Polyvinyl Chloride.** C. H. Alexander, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,193,650. **Antioxidant.** W. L. Semon, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,193,651. **Accelerator**—Polynitroaryl N Diaryl Dithiocarbamate. W. L. Semon, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,193,652. **Accelerator** — Resinous Condensation Product of an Aliphatic Aldehyde and a Diaryl Dithiocarbamic Acid. W. L. Semon, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,193,653. **Accelerator**—Aralkylidene Bis Diaryl Dithiocarbamate. W. L. Semon, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,193,654. **Accelerator**—Diaryl Dithiocarbamic Acid. W. L. Semon, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,193,655. **Accelerator** — Arylenethiazyl Diaryl Dithiocarbamate W. L. Semon, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,193,656. **Accelerator**—Alkali Metal Salt of a Diaryl Dithiocarbamic Acid. W. L. Semon, Silver Lake, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,193,662. **Polyvinyl Chloride Composition** Containing a Plasticizer and an Alkoxyalkyl Ester of a Higher Aliphatic Carboxylic Acid. C. H. Alexander, Cuyahoga Falls, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,193,748. **Antioxidant**—A Secondary Naphthylglucamine. J. Treboux, Neue Welt, assignor to J. R. Geigy, S. A., Basel, both in Switzerland.

2,193,773. **Accelerator**—Quartenary Ammonium Salt of a Diaryl Dithiocarbamic Acid. A. W. Sloan, Akron, O., assignor to B. F. Goodrich Co., New York, N. Y.

2,193,774. **Accelerator**—Mixed Anhydride of a Diaryl Dithiocarbamic Acid and an Organic Carboxy Acid. A. W. Sloan and P. C. Jones, both of Akron, O., assignors to B. F. Goodrich Co., New York, N. Y.

Dominion of Canada

386,792. **Rubber-Seaweed Compositions.** (Latex.) J. S. Campbell, London, England.

386,804. **Paint, Coating, and Molding Composition** Containing a Water Soluble Colloid, a Resin, a Resin Solvent, Alkali, Aluminum Stearate, and Dispersed Rubber. (Latex.) M. R. Isaacs, Philadelphia, Pa., U. S. A.

387,024. **Composition** Comprising Copolymer of Vinyl Halide and a Vinyl Ester of an Ali-

phatic Acid. (Synthetic.) Carbide & Carbon Chemicals, Ltd., Toronto, Ont., assignee of A. K. Doolittle, South Charleston, W. Va.

387,068. **Rubber-like Material** — Condensation Product of a Polyglycol and a Heat-Stable Polybasic Acid. American Cyanamid Co., New York, N. Y., assignee of T. F. Bradley, Westfield, N. J., both in the U. S. A.

387,117. **Vinyl Resin**—Copolymer of a Vinyl Halide and a Vinyl Ester of an Aliphatic Acid. (Synthetic.) Carbide & Carbon Chemicals, Ltd., Toronto, Ont., assignee of A. K. Doolittle, South Charleston, W. Va., U. S. A.

387,126. **Vulcanizing Agent**—$(R-S-A)_3$ N, Where R Is an Organic Radical with the Free Valence on a Carbon Atom and A Is an Alkylene Group. B. F. Goodrich Co., New York, N. Y., assignee of P. C Jones, Akron, O., both in the U. S. A.

United Kingdom

508,764. **Butadiene from Butane.** I. G. Farbenindustrie A.G.

509,166. **Carbon Black and Hydrogen.** W. W. Triggs. (Bayerische Stickstoff Werke A.G.)

509,459. **Treatment of Rubber.** United States Rubber Products, Inc.

509,716. **Treatment of Latex.** United States Rubber Products, Inc.

509,823. **Resinous or Rubber-Like Substances.** (Synthetic.) G. W. Johnson. (I. G. Farbenindustrie A.G.)

510,016. **Accelerators.** W. Baird, R. F. Goldstein, G. E. Nettleship, and Imperial Chemical Industries, Ltd.

510,636. **Synthetic** Rubber. Instituto per Lo Studio della Gomma Sintetica.

511,154. **Plastic Masses, Films, or Lacquers** from Nitrocellulose and Chlorinated Rubber or a Chloride-Containing Vinyl Resin. Deutsche Celluloid Fabrik A.G.

511,430. **α-Dimethylamino-Acrylic Acid Nitrile.** W. W. Groves, (I. G. Farbenindustrie A.G.)

511,644. **Neprene Composition.** ..Callender's Cable & Construction Co., Ltd., and G. M. Hamilton.

511,838. **Synthetic Rubber-Like Materials.** B. J. Habgood, L. B. Morgan, and Imperial Chemical Industries, Ltd.

511,926. **Treating Rubber.** United States Rubber Co.

512,174. **Rubber Composition.** W. T. Henley's Telegraph Works Co., Ltd., H. A. Turnstall, and B. B. Evans.

512,458. **Polymerization Products of 2-Chloro- or 2-Bromo-Butadiene-1.** I. G. Farbenindustrie A.G.

512,479. **Polymerization Products of Butadiene Hydrocarbons.** I. G. Farbenindustrie A.G.

Germany

687,387. **Rubber-like Polymerizates from 2-Butadiene Chloride.** I. G. Farbenindustrie A.G., Frankfurt a.M.

687,613. **Expanding Agent** for the Production of Balls, etc. Chemische Fabrik Lehrte G.m.b.H., vorm. Leonhardt & Martini, Lehrte b. Hannover.

GENERAL

United States

21,364 (Reissue.) **Refrigerator.** C. E. Lipman, Kenilworth, assignor, by mesne assignments, to W. Freeman, Chicago, both in Ill.

21,391. (Reissue.) **Suction Cup Wall Shower Bracket.** O. W. Holden, assignor to Knickerbocker Rubber Co., both of Chicago, Ill.

21,394. (Reissue.) **Thread Protector.** L. H. Lytle, Alliance, O.

21,399. Reissue.) **Cosmetic Applicator.** (Latex.) C. E. Zimmerman, Chicago, Ill.

2,190,659. **Press for Forming Sheet Metal.** H. E. Guerin, Beverly Hills, assignor to Douglas Aircraft Co., Inc., Santa Monica, both in Calif.

2,190,711. **Composite Sheet Insulation Material.** C. F. Hanson, Westfield, assignor to Irvington Varnish & Insulator Co., Irvington, both in N. J.

2,190,728. **Ride Stabilizer** for Car Trucks. J. L. Mohun, Chicago, R. C. Brown, Jr., Evanston, and F W. Test, Hinsdale, all in Ill., Brown and Test assignors to Mohun.

2,190,737. **Cushioned Buffer and Coupling Device.** E. R. Schroeder, Hawthorne, N. J., assignor to American Car & Foundry Co., New York, N. Y.

2,190,740. **Printing Press.** J. R. Swift and R. W. Redin, both of Chicago, Ill.

2,190,762. **Railway Truck** with Pneumatic Cushioned Bolster. R. G. Anderson, Erie, Pa., assignor to General Electric Co., a corporation of N. Y.

2,190,811. **Rubber Covering for Trowels.** J. W. Van Zeeland, Kimberly, Wis.

2,190,864. **Footwear** (Elastic Goring.) R. T. Dawes, Hudson, Mass.

2,190,882. **Coupling** for Vacuum Cleaners. L. W. Pardee, Lakewood, assignor to the Scott & Fetzer Co., Cleveland, both in O.

2,190,891. **Bumper Guard.** J. E. Smith, San Francisco, Calif.

2,190,898. **Tire Display Device.** G. C. Van Veen, Chicago, Ill., assignor to Pharis Tire & Rubber Co., Newark, O.

2,190,905. **Inflatable Tire.** O. Welch, South Bend, Ind.

2,190,916. **Foundation Garment.** E. E. Bertrams, assignor to Kabo Corset Co., both of Chicago, Ill.

2,190,932. **Hose Supporter.** V. G. Corel, San Leandro, Calif.

2,190,946. **Wringer.** S. S. Holland, Sandusky, assignor, by mesne assignments, to Apex Electrical Mfg. Co., Cleveland, both in O.

2,190,954. **Refrigerator Door Seal.** C. A. Stickel, assignor to General Motors Corp., both of Dayton, O.

2,190,982. **Bath Sandal.** W. H. Gilbert, Los Angeles, and F. F. Hosmer, Glendale, both in Calif.

2,191,080. **Electrode Applicator** for Short Wave Radio Therapy. F. N. Lewis, New York, N.Y.

2,191,085. **Clamping Means** for Vehicle Mirrors. A. W. Rosen, New York, N. Y.

2,191,108. **Package Insert** Adaptable for Mounting Fine Thread in Annular Package Form. C. A. Huttinger, Lakewood, assignor to Acme Rayon Corp., Cleveland, both in O.

2,191,110. **Heel Breast Covering Clamp.** G. F. Lybrook, South Portsmouth, Ky.

2,191,197. **Bottle Carton Carriers.** H. Z. Gray, Lebanon, O.

2,191,202. **Wheel Rim Assembly.** H. W. Kranz, Lakewood, assignor to Cleveland Welding Co., Cleveland, both in O.

2,191,227. **Bottle Washing Machine.** J. R. Dostal, assignor to Sturdy-Bilt Equipment Corp., both of Milwaukee, Wis.

2,191,232. **Valve and Sealing Means.** J. Heinen, Long Beach, Calif.

2,191,254. **Comb.** W. Harmon, Hillsville, Pa.

2,191,263. **Refrigerating Apparatus.** C. E. Waring, assignor to General Motors Corp., both of Dayton, O.

2,191,283. **Splint.** E. E. Longfellow, assignor to H. H. Leiter, both of Warsaw, Ind.

2,191,313. **Storage Battery.** H. W. Carlisle, Minneapolis, Minn.

2,191,325. **Face Guard.** E. J. Skillen, Warwick, R. I.

2,191,359. **Aircraft Landing Gear.** P. W. Thornhill, London, assignor to J. H. Onions, Warwickshire, both in England.

2,191,374. **Collapsible Pneumatic Structure.** H. S. Dixon, Dorking, England.

2,191,384, 2,191,385, and 2,191,386. **Electrical Plugs.** W. P. Herman, Bridgeport, Conn., assignor to Electrix Corp., a corporation of R. I.

2,191,392. **Tire Protector.** J. Huarte, Buenos Aires, Argentina.

2,191,398. **Hearing Aid Apparatus.** W. D. Penn, Dallas, Tex.

2,191,406. **Labeling Apparatus.** L. Mandel, assignor to Slick-Shine Co., Inc., both of Newark, N. J.

2,191,423. **Windshield Wiper Arm.** D. B. Browne, Harpenden, England, assignor, by mesne assignments, to Trico Products Corp., Buffalo, N. Y.

2,191,442. **Sponge Rubber Sole.** C. A. Cavey, H. M. Copin, A. V. Hill, and H. C. Hunt, all of Los Angeles, Calif.

2,191,456. **Knitted Fabric.** R. E. Davis, Jr., Fort Payne, Ala., assignor to Interwoven Stocking Co., New Brunswick, N. J.

2,191,495. **Bottle Stopper.** N. M. Nesset, assignor to Baxter Laboratories, Inc, both of Glenview, Ill.

2,191,516. **Tactual Signal.** S. H. Caldwell, assignor to Kelch Heater Co., Detroit, Mich. Mich.

2,191,522. **Roof Covering.** C. R. Eckert, Englewood, N. J., assignor to Celotex Corp., Chicago, Ill.

Dominion of Canada

386,783. **Transparent Muff** for Peeling Onions. D. C. Awalt, Bontilliers Point, Nova Scotia.

386,789. **Golf Ball Body.** E. A. Bogoslowsky, assignee of B. Bogoslowsky, both of New York, N. Y., U. S. A.

386,794. **Ice Skate Walking Appliance.** C. C. Colbert, Elkhart, Ind., U. S. A.

386,811. **Tire Chain Strap.** W. J. Lutey, Seattle, York, N. Y., U. S. A.

386,822. **Locomotive Coupler.** American Locomotive Co., New York, assignee of C. L. Reid, Schenectady, both in N. Y., U. S. A.

386,853. **Hose Coupling Assembly.** Flex-O-Tube Co., Wilmington, Del., assignee of W. H. Miller, Royal Oak, Mich., both in the U.S.A.

386,854. **Hose Expander Tool.** Flex-O-Tube Co., Wilmington, Del., assignee of W. H. Miller, Royal Oak, Mich., both in the U. S. A.

United Kingdom

508,652. **Foundation Garments.** C. S. McMichael.

508,936. **Inner Cushion Member for Tires.** Dunlop Rubber Co., Ltd.

509,100. **Diving Mask.** K. Asari.

509,121. **Motor Mountings.** British Thomson-Houston Co., Ltd.

509,210. **Non-Skid Tire Device.** J. Ferguson.

509,216. **Fountain Pens.** J. H. Payne.

509,220. **Footwear.** Rubo Footwear Proprietary, Ltd.

509,335. **Cables.** Callender's Cable & Construction Co., Ltd.

509,338. **Joint Sealing Means for Self-Laying Vehicle Tracks.** Vickers-Armstrongs, Ltd., Dunlop Rubber Co., Ltd., and B. W. D. Lacey.

509,405. **Cables.** Standard Telephones & Cables, Ltd., T. R. Scott, and J. K. Webb.

509,446. **Pneumatic Tired Wheels.** E. A. Franklin.

509,452. **Tractor Wheels.** Dunlop Rubber Co., Ltd.

509,460. **Windshield Wipers.** P. J. F. Lamandiere.

509,554. **Cables.** Britannic Electric Cable & Construction Co., Ltd., and H. R. Wolfenden.

509,576. **Rubber-Soled Footwear.** Fabriche Riunite Industria Gomma Torino W. Martiny Industria Gommo-Spiga-Sabit-Life.

509,582. **Filters for Aerosols.** Soc. Italiana Pirelli.

509,583. **Tent Material.** F. Peto.

509,586. **Tractor Wheels.** Soc. Anon. des Pneumatiques Dunlop.

509,626. **Joint Sealing Means for Self-Laying Vehicle Tracks.** Vickers-Armstrongs, Ltd., Dunlop Rubber Co., Ltd., and R. F. Daw.

509,645. **Pneumatic Tires.** W. H. Lambert.

TRADE MARKS

United States

375,463. The words: **"Solco Pedic"** with a circle containing the words: **"Supreme Arch Ease It Braces Anatomically Correct."** Footwear. Ideal Shoe Co., Philadelphia, Pa.

375,475. **Posturbilder Personalized Shoes.** Footwear. B. H. Terhune, Maplewood, N. J.

375,477. **Young Notions.** Foundation garments, dress shields, panties, and bathing caps. I. B. Kleinert Rubber Co., New York, N. Y.

375,482. **Lloyd and Thomas.** Footwear. Barnett Cohen, Inc., New York, N. Y.

375,484. **Tech.** Men's wear and garment supporters. Johnson & Balliet, Pittsburgh, Pa.

375,497. **Ak-Tiv-Toes.** Footwear. Ettelbrick Shoe Co., Greenup, Ill.

375,516. **Elast-Eze.** Elastic fabric footwear, spats, and hosiery. Miles Shoes, Inc., New York, N. Y.

375,525. **Gorsees.** Foundation garments. Artistic Foundations, Inc., New York, N. Y.

375,529. **Solaire.** Soles. Alfred Hale Rubber Co., Quincy, Mass.

375,564. **Ty-Ply.** Rubber derivative for bonding rubber to metal. Marbon Corp., Gary, Ind.

375,583. **Chiro-Hesive.** Adhesive, bandage, and foot plaster. Chiropody Supply Headquarters, Inc., Chicago, Ill.

375,666. The words: **"Zig Zag"** over a heavy zig-zag line. Elastic braids, cords, webbings and tapes, and suspender ends. Elastic S. A., Basel, Switzerland.

375,729. Representation of a shield showing representation of a crown and a car, and the words: **"Speed Chief."** Bicycles and structural parts. Firestone Tire & Rubber Co., Akron, O.

375,747. **Surfrenu.** Lacquer for resurfacing rubber footwear. Sears, Roebuck & Co., Chicago, Ill.

375,753. **Mor-Flex.** Elastic yarn. Moore Fabric Co., Pawtucket, R. I.

375,765. Design formed by repetition of the words: **"RCO National."** Rubber slabs. Jacobs Leather Co., Boston, Mass.

375,777. **Francoat.** Corsets. Franco Corset Co., New York, N. Y.

375,827. **Marvel-Belt.** Corsets. Sears, Roebuck & Co., Chicago, Ill.

375,855. **Fram.** Hose lines. Fleming Mfg. Co., East Providence, R. I.

375,864. **Representation** of a brush over the word: **"Keel,"** surrounded by a circular ribbon bearing the words: **"Blue Streak Line."** Brushes for retreading, vulcanizing, and general tire work, tire groovers, rasps, branders, etc. Keel & Co., Inc., Philadelphia, Pa.

375,903. Repesentation of a bee-hive, three bees, above the words: **"Beebe Bros."** Beebe Bros. Rubber Co., Nashua, N. H.

375,904. An oval containing representation of two men on a coach. Rubber heels and soles and rubber composition. Beebe Bros. Rubber Co., Nashua, N. H.

Market Reviews

CRUDE RUBBER

Commodity Exchange

TABULATED WEEK-END CLOSING PRICES ON THE NEW YORK MARKET

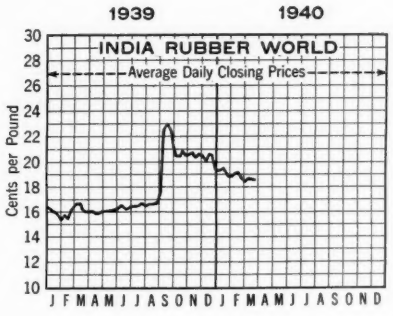
Futures	Jan. 27	Feb. 24	Mar. 2	Mar. 9	Mar. 16	Mar. 23
Feb.	.....	18.16	.....	.....	.....	.....
Mar.	18.57	18.21	18.59	18.55	18.20	18.45
Apr.	.....	.....	18.50	18.50	18.14	18.45
June	.....	.....	18.29	18.38	18.03	18.31
July	18.00	17.78	18.18	18.32	17.98	18.17
Sept.	17.85	17.65	18.06	18.18	17.90	18.06
Dec.	17.66	17.50	17.90	18.06	17.75	17.90
Jan.	.....	17.45	17.90	18.06	17.75	17.85
Feb.	.....	.....	17.90	18.06	17.75	17.85
Volume per week (tons)	6,410	7,630	10,840	4,880	9,250	3,110

THE rubber market here ruled generally firm during March. After closing at 18.03¢ per pound March 1, July futures advanced to close at 18.47¢ on March 12, then weakened, closing at 17.98¢ on March 17. Recovering somewhat, the price moved up to close at 18.15¢ on March 21. Thereafter the market was easier, and the closing price on March 28 was 17.89¢ per pound. Trading in March continued light.

With indications, seen in large afloat figures, that the tight supply situation here will be relieved considerably during the next few months, the premiums which the spot and nearby delivery months have been commanding over forward deliveries may be narrowed further.

Crude rubber consumption in the United States during February of 49,832 tons, although 9.4% below January, was 17.6% higher than in February, 1939. For the first two months of 1940, U. S. usage was at a record high level of 104,810 tons. During March consumption continued at the somewhat reduced rate of February, with an increase in usage expected to develop in April and May.

According to a British government ruling (effective March 25), exports of rubber are now on a fixed sterling basis rather than the free sterling basis effective previously. With free sterling running about 5 to 6% under the official rate, the ordered change theoretically raises prices to be paid in this country by about 5%. In anticipation of this factor, strength has been added to the market.



New York Outside Market—Spot Ribbed Smoked Sheets

Net U. S. imports of crude rubber during February were 41,797 long tons, against 71,541 tons (revised) in January. Reexports for February were 1,291 tons, against 955 tons (revised) for January. Continental European countries took over 82% of the February reexports.

New York Outside Market

The outside market became more active during March, with a fair amount of factory and shipment business reported. Shipment business from the Far East was largely of Dutch origin. The market was steady; No. 1 ribbed smoked sheets closed at 18½¢ per pound on March 1, and held generally steady throughout the month, closing at 18⅝¢ on March 21. The closing price on March 28 was 18½¢ per pound, with the market weaker.

The week-end closing prices on No. 1 ribbed smoked sheets follow: March 2, 18 11/16¢; March 9, 18 11/16¢; March 16, 18⅜¢; and March 23, 18⅝¢.

United States Latex Imports

Year	Pounds (d.r.c.)	Value
1937	51,934,040	$10,213,670
1938	26,606,048	4,147,318
1939	61,460,003	10,467,552
1940		
Jan.	7,639,568	1,412,728

Data from Leather and Rubber Division, Washington, D. C.

New York Quotations

New York outside market rubber quotations in cents per pound

	Mar. 27, 1939	Feb. 27, 1940	Mar. 27, 1940
Plantations			
Rubber latex..*gal.*	59/60	71/72	73/74
Paras			
Upriver fine.....	13½	16¾	17⅛
Upriver fine.....	*16¼	*18¾	*19¼
Upriver coarse ...	9½	11½	11½
Upriver coarse ...	*14½	*16	*17½
Islands fine.....	13¼	16	17¼
Islands fine.....	*15½	*18¾	*19¾
Acre, Bolivian fine	13¾	17	17½
Acre, Bolivian fine	*16½	*19¾	*20
Beni, Bolivian fine	14½	17¾	17½
Madeira fine	13½	16¾	17⅛
Caucho			
Upper ball	9½	11½	11½
Upper ball	*14½	*16	*17¼
Lower ball	9¼	11¼	11¼
Pontianak			
Pressed block	9/13½	12/20	13/18
Guayule			
Ampar	13¼	15	15
Africans			
Rio Nuñez	14	19	18½
Black Kassai	14	19	18½
Prime Niger flake	25	22	22½
Gutta Percha			
Gutta Siak	10	17	17
Gutta Soh	14½	24	28
Red Macassar ...	80/1.20	1.20	1.20
Balata			
Block Ciudad Bolivar	29	40	..
Manaos block ...	29	40	45
Surinam sheets ..	40	47	50
Amber	42	49	..

*Washed and dried crepe. Shipments from Brazil.

Rubber and Canvas Footwear Statistics

	Thousands of Pairs		
	Inventory	Production	Shipments
1937	20,430	74,102	67,191
1938	16,183	50,812	54,942
1939	16,388	60,612	60,377
1939			
Jan.	16,157	4,807	4,778
Feb.	16,582	4,953	4,629
Mar.	17,281	5,897	5,214
Apr.	18,083	5,216	4,414
May	19,055	5,033	4,017
June	19,729	4,866	4,192
July	18,115	3,280	4,894
Aug.	16,956	5,090	6,213
Sept.	15,218	4,713	6,452
Oct.	14,619	5,332	5,916
Nov.	15,195	6,049	5,473
Dec.	16,388	5,376	4,185
1940			
Jan.	15,018	5,044	6,389

The above figures have been adjusted to represent 100% of the industry based on reports received which represented 81% for 1936-37.

Source: *Survey of Current Business*, Bureau of Foreign & Domestic Commerce, Washington, D. C.

New York Outside Market—Spot Closing Prices—Plantation Grades—Cents per Pound

	February, 1940				March, 1940																	
	26	27	28	29	1	2	4	5	6	7	8	9	11	12	13	14	15	16	18	19	20	21	22*	23
No. 1 Ribbed Smoked Sheet.	18⅜	18¼	18 2/16	18 2/16	18½	18 11/16	18½	18 5/16	18¾	18¾	18 11/16	18 11/16	18⅞	18⅞	18¾	18½	18⅜	18⅜	18⅜	18½	18 2/16	18⅝	..	18⅝
No. 1 Thin Latex Crepe....	18⅞	18¾	18 12/16	19 1/16	19	19 1/16	19	19⅛	19¼	19¼	19 1/16	19 1/16	19⅜	19⅜	19¼	18⅞	18¾	18¾	18¾	18⅞	18 12/16	19	..	19
No. 2 Thick Latex Crepe...	18⅝	18½	18 1/16	18 12/16	18¾	18 12/16	18¾	18⅞	19	19	19 1/16	19 1/16	19⅛	19⅛	19	18¾	18⅝	18⅝	18⅝	18¾	18 12/16	18⅞	..	18⅞
No. 1 Brown Crepe.....	17⅞	17¾	17 12/16	18 1/16	18	18 1/16	18	18⅛	18¼	18¼	18 1/16	18 1/16	18⅜	18⅜	18¼	18	17⅞	17⅞	17⅞	18	18 1/16	18⅛	..	18⅛
No. 2 Brown Crepe.....	17¾	17½	17 1/16	17 12/16	17¾	17 12/16	17¾	17⅞	18	18	18 1/16	18 1/16	18⅛	18⅛	18	17¾	17⅝	17⅝	17⅝	17¾	17 12/16	17⅞	..	17⅝
No. 2 Amber.....	17⅞	17¾	17 12/16	18 1/16	18	18 1/16	18	18⅛	18¼	18¼	18 1/16	18 1/16	18⅜	18⅜	18¼	18	17⅞	17⅞	17⅞	18	18 1/16	18⅛	..	18⅛
No. 3 Amber.....	17⅜	17½	17 1/16	17 12/16	17¾	17 12/16	17¾	17⅞	18	18	18 1/16	18 1/16	18⅛	18⅛	18	17¾	17⅝	17⅝	17⅝	17¾	17 12/16	17⅞	..	17⅝
Rolled Brown.....	15½	15¼	15 2/16	15 1/16	15⅜	15 1/16	15⅜	15¼	15⅜	15⅜	15 1/16	15 1/16	15½	15½	15⅜	15⅛	15	15	15	15⅛	15 1/16	15¼	..	15¼

*Closed.

IMPORTS, CONSUMPTION, AND STOCKS

United States and World Statistics of Rubber Imports, Exports, Consumption, and Stocks—Long Tons

Twelve Months	U. S. Imports*	U. S. Consumption¶	U. S. Stocks Mfrs. Dealers, Importers, Etc.†	U. S. Afloat†	U. K.—Public Warehouses, London Liverpool†‡	Singapore and Penang Dealers and Port Stocks†‡	World Production (Net Exports)‡	World Consumption Estimated‡	World Stocks†‡
1937	584,851	543,600	262,204	63,099	57,785	44,792	1,139,800	1,105,002	646,252
1938	400,178	437,031	231,500	45,105	86,853	27,084	894,900	942,252	596,498
1939	499,473	577,591	140,280	91,095	.....	15,346	1,005,154	1,088,882	.....
1939									
Jan.	39,082	46,234	223,879	48,210	80,643	30,975	87,661	89,034	585,441
Feb.	36,490	42,365	217,534	55,814	75,517	28,559	77,290	83,867	568,780
Mar.	38,989	50,165	205,936	55,981	72,235	23,255	76,839	95,044	545,459
Apr.	29,601	44,166	190,896	57,918	68,931	22,434	73,896	86,882	518,651
May	47,535	44,377	193,602	54,046	66,020	20,849	70,812	89,305	511,847
June	35,947	47,259	181,794	51,274	63,878	19,563	65,052	90,952	500,837
July	36,739	43,880	174,240	52,990	57,234	27,042	84,500	87,901	497,126*a*
Aug.	38,045	50,481	161,362	66,717	44,917	20,543	92,408	97,109	477,666*a*
Sept.	41,939	50,150	150,171	68,310	.....	23,457	87,430	84,913	.....
Oct.	41,250	55,764	133,183	100,500	.....	25,376	115,087	95,200	.....
Nov.	42,706	54,322	118,535	114,044	.....	22,957	85,707	95,612	.....
Dec.	71,395	48,428	140,280*b*	91,095	.....	15,346	88,472	93,210	.....
1940									
Jan.	72,496	54,978	156,830*b*	90,285*b*	.....	35,974	108,275	97,114	.....
Feb.	43,088	49,832	148,776*b*	112,257*b*	.....	.....	.....	.....	.....

*Including liquid latex. †Stocks on hand the last of the month or year. ‡Statistical Bulletin of the International Rubber Regulation Committee. §Stocks at U. S. A., U. K., Singapore and Penang, Para, Manaos, regulated areas, and afloat. ¶Corrected to 100% from estimate of reported coverage. *a* Not including stocks at French dealers. *b*. Includes government barter rubber.

THE R. M. A. estimates United States rubber manufacturers during February consumed 49,832 long tons of crude rubber, 9.4% under the 54,978 long tons consumed in January, but 17.6% above the February, 1939, consumption figure of 42,365 long tons.

Gross imports for February, as reported by the Department of Commerce, were 43,088 long tons, 40.6% under the January figure of 72,496 long tons, but 18.1% over the February, 1939, imports, of 36,490 long tons.

Total domestic stocks on February 29 are estimated by the R. M. A. at 148,776 long tons, 5.1% under the 156,830 long tons on hand January 31 and 31.6% under the 217,534 long tons on hand February 28, 1939.

Crude rubber afloat to U. S. ports on February 29 is set at 112,257 long tons, against 90,285 long tons on January 31 and 55,814 long tons afloat February 28, 1939.

The February 29, 1940, stocks and rubber afloat estimates include U. S. government emergency figures at 2,322 and 4,072 long tons respectively.

U. S. Crude and Waste Rubber Imports for 1940

	Plantations	Latex	Paras	Africans	Centrals	Guayule	Totals 1940	Totals 1939	Balata	Miscellaneous	Waste
Jan. .....*tons*	68,832	2,768	406	161	74	255	72,496	39,082	107	648	241
Feb.	40,338	1,458	553	453	30	256	43,088	36,490	75	316	34
Total 2 mos., 1940 .....*tons*	109,170	4,226	959	614	104	511	115,584	.....	182	964	275
Total 2 mos., 1939 .....*tons*	70,857	2,984	709	404	12	516	.....	75,572	106	1,488	382

Compiled from The Rubber Manufacturers Association, Inc., statistics.

Tire Production Statistics

Pneumatic Casings

	Inventory	Production	Shipments
1938	8,451,390	40,906,735	43,132,302
1939	8,688,215	57,077,969	56,975,044
1940			
Jan.	9,388,742	4,976,548	4,276,512
Feb.	10,156,918	4,910,754	4,118,030

Pneumatic Casings

	Original Equipment	Replacement Sales	Export Sales
1938	10,716,130	30,565,008	1,048,934
1939	18,164,441	37,536,608	1,273,995
1940			
Jan.	1,804,606	2,382,826	89,080
Feb.	1,974,273	2,057,092	86,665

Inner Tubes

	Inventory	Production	Shipments
1938	8,165,696	37,847,656	40,292,614
1939	7,173,642	51,367,418	51,758,353
1940			
Jan.	7,633,798	4,286,924	3,826,667
Feb.	7,896,960	4,210,904	3,809,733

Source: The Rubber Manufacturers Association, Inc. Figures adjusted to represent 100% of the industry.

British Malaya

An official cable from Singapore to the Malayan Information Agency, Malaya House, 57 Trafalgar Sq., London, W.C.2, England, gives the following figures for January, 1940:

Rubber Gross Exports: Ocean Shipments from Singapore, Penang, Malacca, and Port Swettenham.

To	Sheet and Crepe Rubber Tons	Latex, Concentrated Latex, Revertex and Other Forms of Latex Tons
United Kingdom	5,297	652
United States	35,967	1,096
Continent of Europe	3,824	105
British possessions	4,208	67
Japan	3,542	45
Other countries	1,389	22
Totals	54,227	1,987

Rubber Imports: Actual, by Land and Sea.

From	Dry Rubber Tons	Wet Rubber (Dry Weight) Tons
Sumatra	13,302	366
Dutch Borneo	4,507	1
Java and other Dutch islands.	876	..
Sarawak	2,275	36
British Borneo	811	57
Burma	379	9
Siam	4,301	1,168
French Indo-China	1,695	197
Other countries	141	15
Totals	28,287	1,849
Latex from Java.....	5 (tons)	

World Net Imports of Crude Rubber—Long Tons

Year	U.S.A.	U.K.†	Argentine	Australia	Belgium	Canada	France	Greater Germany‡	Italy	Japan	Poland	Sweden	U.S.S.R.	Rest of World	Total
1937...	592,500	135,900	9,500	19,300	15,000	36,100	60,000	115,000	24,000	62,200	6,100	6,700	30,400	52,600	1,120,400
1938...	406,300	168,172	7,700	12,300	11,300	25,700	58,100	107,900	28,200	46,300	7,900	8,300	26,800	49,200	928,000
1939...	486,348	....	....	....	9,593	32,508	....	....	....	....	....	....	....	....	....
1939															
Jan. ..	36,614	7,121	417	954	898	2,867	4,694	9,095	2,133	2,553	665	643	4,000*	4,282	70,651
Feb. ..	30,578	8,087	1,092	1,785	1,068	1,451	5,327	8,348	2,025	3,263	709	467	1,000*	4,824	66,710
Mar. ..	45,286	12,092	440	1,324	1,242	2,458	4,503	9,028	1,525	4,019	985	581	2,000*	4,901	86,374
Apr. ..	31,590	7,120	786	1,138	855	1,559	5,650	9,316	1,926	3,579	673	994	2,000*	4,614	69,432
May ..	45,390	10,488	353	1,202	792	3,069	4,646	9,031	1,573	4,438	940	1,047	1,000*	5,818	86,830
June ..	33,950	10,287	965	1,348	621	2,465	4,649	8,677	1,992	3,067	693	2,252	500*	4,800	74,295
July ..	36,932	6,205	983	1,472	836	3,214	4,282	8,849	1,408	3,668	750*	644	1,000*	4,541	72,520
Aug. ..	38,319	9,391	619	2,182	952	2,187	....	....	....	3,146	....	1,057	2,500*	5,286	77,030
Sept. ..	36,197	....	965	875	108	2,639	....	....	....	2,801	....	280	....	4,819	....
Oct. ..	39,735	....	562	1,335	519	5,787	....	....	....	2,749	....	....	....	4,647	....
Nov. ..	41,478	....	359	1,500*	667	1,709	....	....	....	5,106	....	....	....	5,476	....
Dec. ..	70,279	....	....	....	1,035	3,103	....	....	....	....	....	....	....	....	....

* Estimated. †U. K. figures show gross imports, not net imports. ‡Including imports of Austria and Czechoslovakia. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

COMPOUNDING INGREDIENTS

COMPOUNDING ingredients were in somewhat better demand during March. Further increases in consumption are expected in April and May when greater activity in rubber manufacturing is anticipated.

Major market feature was an advance in the price of carbon black for the second quarter, as shown below. Litharge advanced ¼¢ per pound; while double-pressed stearic acid receded to 11¼¢ per pound. Other prices are generally firm and unchanged.

CARBON BLACK. Carlot prices on compressed and beads in bags were advanced, effective April 1, 0.225¢ per pound and in bulk, 0.20¢. New bag prices are: 2.65¢ per pound, f.o.b. works and 3.525¢, f.o.b. North Atlantic docks. Bulk prices are 2.50¢ per pound, f.o.b. works, and 3.38¢, f.o.b. Hoboken, N. J. Second quarter l.c.l. prices were advanced ½¢ per pound. The base export price was raised ⅛¢ per pound on March 8, effective on that date, to 3⅛¢.

The demand was excellent; the price advance announcement was a contributing factor in increased activity. Stocks at the end of February were 123,000,000 pounds, against 126,250,000 pounds at the end of January.

FACTICE OR RUBBER SUBSTITUTE. The demand was fair, and prices remained unchanged.

LITHARGE. The price was advanced ¼¢ per pound last month, reflecting strength in pig lead. Demand was improved.

LITHOPONE. Sales were considered normal and satisfactory. The price is firm and unchanged.

RUBBER CHEMICALS. The demand for accelerators and antioxidants was reported excellent and only slightly under the very high level of November. A slight increase is expected in April and May. Prices are generally unchanged.

RUBBER SOLVENTS. Consumption by Akron tire makers continued in good volume. The price is unaltered.

TITANIUM PIGMENTS. An increase in demand from the rubber industry became apparent in the second week of March and continued throughout the month. With more activity in the production of white rubber footwear and sportswear forthcoming in the spring, heavier withdrawals are anticipated. Prices continue unchanged and probably will hold steady through the second quarter.

ZINC OXIDE. Shipments to consumers continued in good volume, with heavier demands from both paint and rubber industries expected in the second quarter. Prices are steady.

Current Quotations*

Abrasives

Pumicestone, powdered	lb.	$0.03 / $.035
Rottenstone, domestic	lb.	.03 / .035
Silica, 15	ton	

Accelerators, Inorganic

Lime, hydrated, *l.c.l.*, New York	ton	20.00
Litharge (commercial)	lb.	.0675/ .0725

Accelerators, Organic

A-1	lb.	.24 / .30
A-10	lb.	.31 / .35
A-11	lb.	.52 / .65
A-19	lb.	.52 / .65
A-32	lb.	.70 / .80
A-77	lb.	.42 / .55
A-100	lb.	.42 / .55
Accelerator 49	lb.	.40 / .42
737	lb.	.42 / .43
737-50	lb.	.25 / .26
808	lb.	.70 / .72
833	lb.	1.15
Acrin	lb.	.60
Aldehyde ammonia	lb.	.65 / .70
Altax	lb.	.55 / .60
B-J-F	lb.	.50 / .55
Beutene	lb.	.70 / .75
Butyl Eight	lb.	.98 / 1.00
Zimate	lb.	2.50
C-P-B	lb.	2.00
Captax	lb.	.50 / .55
Crylene	lb.	.40 / .47
Paste	lb.	.30 / .36
D-B-A	lb.	2.00
Delac A	lb.	.40 / .50
O	lb.	.40 / .50
P	lb.	.40 / .50
Di-Esterex-N	lb.	.60 / .70
DOTG (Di-ortho-tolyguanidine)	lb.	.44 / .46
DPG (Diphenylguanidine)	lb.	.35 / .45
El-Sixty	lb.	.50 / .65
Ethylideneaniline	lb.	.42 / .43
Ethyl Zimate	lb.	2.50
Formaldehyde P.A.C.	lb.	.0625
Formaldehydeaniline	lb.	.31
Formaldehyde-para-toluidine	lb.	.52 / .54
Guantal	lb.	.40 / .50
Hepteen	lb.	$0.35 /$0.40
Base	lb.	1.35 / 1.50
Hexamethylenetetramine U.S.P.	lb.	.39
Technical	lb.	.33
Lead oleate, No. 999	lb.	.135
Witco	lb.	.15
Ledate	lb.	2.35
Monex	lb.	2.35
Novex	lb.	
O. N. V.	lb.	1.00 / 1.10
O-X-A-F	lb.	.50 / .55
Ovac	lb.	.50 / .55
Para-nitroso-dimethylaniline	lb.	.85
Pentex	lb.	1.00 / 1.10
Flour	lb.	.15 / .16
Pip-Pip	lb.	2.50
Pipsolene	lb.	1.55 / 1.85
R-2	lb.	1.40 / 1.80
R-23	lb.	.40
R & H 50-D	lb.	.42 / .43
Rotax	lb.	.60 / .65
Safex	lb.	1.20 / 1.30
Santocure	lb.	.80 / 1.00
Selenac	lb.	2.75
Super-sulphur No. 1	lb.	.50
2	lb.	.18 / .20
Tetrone A	lb.	2.70
Thiocarbanilide	lb.	.24 / .30
Thionex	lb.	2.35
Thiurad	lb.	2.35
Trimene	lb.	.55 / .65
Base	lb.	1.05 / 1.20
Triphenylguanidine (TPG)	lb.	.45
Tuads	lb.	2.35
Ureka	lb.	.60 / .75
Blend B	lb.	.60 / .75
C	lb.	.56 / .65
Vulcanex	lb.	.42 / .43
Vulcanol	lb.	.85
Z-B-X	lb.	2.50
Zenite	lb.	.46 / .48
A	lb.	.53 / .55
B	lb.	.46 / .48
Zimate	lb.	2.35

Activators

Aero Ac 50	lb.	.46 / .56
Barak	lb.	.50

Age Resisters

AgeRite Alba	lb.	1.50 / 1.65
Exel	lb.	1.00 / 1.02
Gel	lb.	.57 / .59
Hipar	lb.	.65 / .67
Powder	lb.	.52 / .54
AgeRite Resin	lb.	.52 / .54
D	lb.	.52 / .54
White	lb.	1.25 / 1.40
Akroflex C	lb.	$0.56 /$0.58
Albasan	lb.	.70 / .75
Aminox	lb.	.52 / .61
Antox	lb.	.56
B-L-E	lb.	.52 / .61
Powder	lb.	.65 / .74
B-X-A	lb.	.52 / .61
Copper Inhibitor X-872-A	lb.	1.15
Flectol B	lb.	.52 / .65
H	lb.	.52 / .65
White	lb.	.90 / 1.15
M-U-F	lb.	1.50
Neozone (standard)	lb.	.63
A	lb.	.52 / .54
B	lb.	.63
C	lb.	.52 / .54
D	lb.	.52 / .54
E	lb.	.63
Oxynone	lb.	.64 / .80
Parazone	lb.	.68
Permalux	lb.	1.20
Santoflex B	lb.	.52 / .65
Solux	lb.	1.30
Thermoflex A	lb	.65 / .67
Tysonite	lb.	.16
V-G-B	lb.	.52 / .61

Alkalies

Caustic soda, flake, Columbia (400-*lb. drums*)	100 lbs.	2.70 / 3.55
liquid, 50%	100 lbs.	1.95
solid (700-*lb. drums*)	100 lbs.	2.30 / 3.15

Antiscorch Materials

A-F-B	lb.	.35 / .40
Antiscorch T	lb.	.90
Cumar R.H.	lb.	.10
E-S-E-N	lb.	.35 / .40
R-17 Resin (*drums*)	lb.	.10
RM	lb.	1.25
Retarder W	lb.	.36
U.T.B.	lb.	.35 / .40

Antisun Materials

Heliozone	lb.	.21
Sunproof	lb.	.22 / .27

Brake Lining Saturant

B.R.T. No. 3	lb.	.0165/ .0175

Colors

Black

Du Pont powder	lb.	.42 / .44
Lampblack (commercial), *l.c.l.*	lb.	.15

Blue

Brilliant	lb.	
Du Pont dispersed	lb.	.83 / 3.95
Powders	lb.	2.25 / 3.75
Toners	lb.	.08 / 3.85

Brown

Mapico	lb.	.11

Green

Brilliant	lb.	
Chrome, light	lb.	
medium	lb.	.22
oxide (*freight allowed*)	lb.	
Dark	lb.	
Du Pont dispersed	lb.	.98 / 1.75
Powders	lb.	1.00 / 5.50
Guignet's (*bbls.*)	lb.	.70
Light	lb.	
Toners	lb.	.85 / 3.75

Orange

Du Pont dispersed	lb.	.88 / .98
Powders	lb.	.88 / 2.75
Lake	lb.	
Toners	lb.	.40 / 1.60

Orchid

Toners	lb.	1.50 / 2.00

Pink

Toners	lb.	1.50 / 2.00

Purple

Permanent	lb.	
Toners	lb.	.60 / 2.10

Red

Antimony Crimson, 15/17%	lb.	
R. M. P. No. 3	lb.	.48
Sulphur free	lb.	
R.M.P.	lb.	.52
Golden 15/17%	lb.	
7-A	lb.	.37
Z-2	lb.	.23
Cadmium, light (400-*lb. bbls.*)	lb.	.75 / .80
Chinese	lb.	
Crimson	lb.	
Du Pont dispersed	lb.	.93 / 2.05
Powders	lb.	.285 / 1.05
Mapico	lb.	.0925
Medium	lb.	
Rub-Er-Red (*bbls.*)	lb.	.0925
Scarlet	lb.	.08 / 2.00
Toners	lb.	.08 / 2.00

*Prices in general are f.o.b. works. Range indicates grade or quantity variations. Prices not recorded will be supplied upon request.

White

Lithopone (*bags*)	*lb.*	$0.0360/$0.0385
Albalith	*lb.*	.0375/ .04
Astrolith	*lb.*	.0360/ .0385
Azolith	*lb.*	.0360/ .0385
Cryptone-BA-19	*lb.*	.05 / .0525
BT	*lb.*	.05 / .0525
CB	*lb.*	.05 / .0525
ZS No. 20	*lb.*	.075 / .0775
86	*lb.*	.075 / .0775
230	*lb.*	.075 / .0775
Sunolith	*lb.*	.0360/ .0385
Ray-Bar	*lb.*	.0525/ .0575
Ray-Cal	*lb.*	.05 / .0525
Rayox	*lb.*	.13
Titanolith (*5-ton lots*)	*lb.*	.05 / .0525
Titanox-A (*50-lb. bags*)	*lb.*	.13 / 1375
B (*50-lb. bags*)	*lb.*	.0525/ .0550
30 (*50-lb. bags*)	*lb.*	.0525/ .0550
C (*50-lb. bags*)	*lb.*	.05 / .0525
M (*50-lb. bags*)	*lb.*	.0525/ .0550
Ti-Tone	*lb*	
Zinc Oxide		
Azo ZZZ-11	*lb.*	.0625/ .0650
44	*lb.*	.0625/ .0650
55	*lb.*	.0625/ .0650
66	*lb.*	.0625/ .0650
French Process, Florence		
Green Seal-8	*lb.*	.08 / .0825
Red Seal-9	*lb.*	.075 / .0775
White Seal-7	*lb.*	.085 / .0875
Kadox, Black Label-15	*lb.*	.065 / .0675
No. 25	*lb.*	.075 / .0775
Red Label-17	*lb.*	.065 / .0675
Horse Head Special 3	*lb.*	.0625/ .065
XX Red-4	*lb.*	.0625/ .065
23	*lb.*	.0625/ .065
72	*lb.*	.0625/ .065
78	*lb.*	.0625/ .065
80	*lb.*	.0625/ .065
103	*lb.*	.0625/ .065
110	*lb.*	.0625/ .065
St. Joe (lead free)		
Black Label	*lb.*	.0625/ .065
Green Label	*lb.*	.0625/ .065
Red Label	*lb.*	.0625/ .065
U.S.P.	*lb.*	.095 / .0975
White Jack	*lb.*	.075 / .0775
Zopaque (*bags*)	*lb.*	.13 / .1375

Yellow

Cadmolith (cadmium yellow), (*400-lb. bbls.*)	*lb.*	.50 / .55
Du Pont dispersed	*lb.*	1.25 / 1.75
Powders	*lb.*	.135 / 2.75
Lemon	*lb.*	
Mapico	*lb.*	.0675
Toners	*lb.*	2.50

Dispersing Agents

Bardol	*lb.*	.0245/ .045
Darvan	*lb.*	.30 / .39
Nevoll (*drums, carlot*)	*lb.*	.0245
Santomerse S	*lb.*	.11 / .25

Fillers, Inert

Asbestine, *c.l.*	*ton*	15.00
Barytes	*ton*	30.00 /36.00
f.o.b., St. Louis (*50-lb. paper bags*)	*ton*	22.85
off color, domestic	*ton*	20.00 /25.00
white, imported	*ton*	29.00 /32.00
Blanc fixe, dry, precip.	*lb.*	.03 / .035
Calcene	*ton*	37.50 /43.00
Infusorial earth	*lb.*	.02 / .03
Kalite No. 1	*ton*	24.00 /30.00
3	*ton*	34.00 /40.00
Kalvan	*lb.*	
Magnesia, calcined, heavy	*lb.*	.04
Carbonate, *l.c.l.*	*lb.*	.07 / .095
Paradene No. 2 (*drums*)	*lb.*	.045
Pyrax A	*ton*	6.00 /20.00
Whiting		
Columbia Filler	*ton*	9.00 /14.00
Guilders	*100 lbs.*	
Paris white, English cliff-stone	*100 lbs.*	
Southwark Brand (commercial)	*100 lbs.*	
All other grades	*100 lbs.*	
Suprex, white extra light	*ton*	45.00
heavy	*ton*	45.00
Witco, *c.l.*	*ton*	6.00

Finishes

Rubber lacquer, clear	*gal*	
colored	*gal.*	
Starch, corn, pwd.	*100 lbs.*	
potato	*lb.*	
Talc	*ton*	

Flock

Cotton flock, dark	*lb.*	.10 / .12
dyed	*lb.*	.40 / .80
white	*lb.*	.11 / .19
Rayon flock, colored	*lb.*	1.00 / 1.50
white	*lb.*	.75 / 1.00

Latex Compounding Ingredients

Accelerator 85	*lb.*	.35
89	*lb.*	1.40
122	*lb.*	1.55
552	*lb.*	2.50
Aerosol OT Aqueous 10%	*lb.*	$0.15 /$0.175
Antox, dispersed	*lb.*	.42
Aquarex A	*lb.*	.35
D	*lb.*	.75
F	*lb.*	.85
WA Paste	*lb.*	.28
Areskap No. 50	*lb.*	.18 / .24
100, dry	*lb.*	.39 / .51
Aresket No. 240	*lb.*	.16 / .22
300, dry	*lb.*	.42 / .50
Aresklene No. 375	*lb.*	.35 / .50
400, dry	*lb.*	.51 / .65
Black No. 25, dispersed	*lb.*	.22 / .40
Catalpo	*ton*	
Collocarb	*lb.*	.07
Color Pastes, dispersed	*lb.*	.35 / 1.90
Compound G-11 NW	*lb.*	
Dispersex No. 15	*lb.*	.11 / .12
No. 20	*lb.*	.08 / .10
Emo, brown	*lb.*	.15
white	*lb.*	.15
Factice Compound, dispersed	*lb.*	.36
Heliozone, dispersed	*lb*	.25
Igepon A	*lb.*	
Latac	*lb.*	
MICRONEX, Colloidal	*lb.*	.055 / .0655
Nekal BX (dry)	*lb.*	
Palmol	*lb.*	.13
Pipsol X	*lb.*	3.05 / 3.55
R-2 Crystals	*lb.*	2.50 / 2.75
R-23	*lb.*	.40
RN-2	*lb.*	2.00 / 2.25
Crystals	*lb.*	2.00 / 2.25
S-1 (*400-lb. drums*)	*lb.*	.65
Santobrite Briquettes	*lb.*	.17 / .26
Powder	*lb.*	.16 / .26
Santomerse D	*lb.*	.41 / .65
S	*lb.*	.11 / .25
No. 1	*lb.*	.18 / .35
No. 2	*lb.*	.18 / .35
No. 3	*lb.*	.40 / .65
No. 3P	*lb.*	.29 / .45
Santovar A	*lb*	1.15 / 1.40
Stablex A	*lb.*	.90 / 1.10
B	*lb.*	.65 / .90
C	*lb.*	.40 / .50
Sulphur, dispersed	*lb.*	.10 / .15
No. 2	*lb.*	.075
T-1 (*400-lb. drums*)	*lb.*	.40
Tepidone	*lb.*	1.20
Vulcan Colors	*lb.*	
Zinc oxide, dispersed	*lb.*	.12 / .15

Mineral Rubber

Black Diamond	*ton*	25.00
B.R.C. No. 20	*lb.*	.009 / .01
Hydrocarbon, hard	*ton*	23.00
Genasco Hydrocarbon, granulated	*ton*	
solid	*ton*	
Gilsonite	*ton*	
Parmr	*ton*	
Pioneer	*ton*	
285°-300°	*ton*	21.00 /42.00

Mold Lubricants

Mold Paste	*lb.*	.12 / .18
Sericite	*ton*	65.00 /75.00
Soapbark	*lb.*	
Soapstone, *l.c.l.*	*ton*	25.00 /35.00

Oil Resistant

AXF	*lb.*	.40 / .50

Reclaiming Oils

B.R.V.	*lb.*	.032 / .0345
S.R.O.	*lb.*	.0195/ .0205
X-159 rubber reclaiming oil	*gal.*	.20

Reenforcers

Carbon Black

Aerfloted Arrow Specification (*bags only*)	*lb.*	.0265†
Arrow Compact Granulized	*lb.*	.0265†
Certified Heavy Compressed (*bags only*)	*lb.*	.0265†
Spheron	*lb.*	.0265†
Continental, dustless	*lb.*	.0265†
Compressed (*bags only*)	*lb.*	.0265†
Disperso	*lb.*	.0265†
Dixie	*lb.*	.0265†
Dixiedensed	*lb.*	.0265†
66	*lb*	.0265†
Excello, dustless	*lb.*	.0265†
Heavy compressed (*bags only*)	*lb.*	.0265†
Fumonex	*lb.*	.03
Gastex	*lb.*	.03 / .07
Kosmobile	*lb.*	.0265†
66	*lb.*	.0265†
Kosmos	*lb.*	.0265†
MICRONEX Beads	*lb.*	.0265†
Mark II	*lb.*	.0265†
Standard	*lb.*	.0265†
W-5	*lb.*	.0265†
W-6	*lb.*	.0265†

†Price quoted is f.o.b. works (bags). The price f.o.b. works (bulk) is 2.50¢ per pound. f.o.b. Hoboken (bulk), 3.38¢; f.o.b. No. Atlantic Docks (bags), 3.525¢. All prices are carlot.

P-33	*lb.*	$0.0475/$0.0725
Pelletex	*lb.*	.03 / .07
Supreme, dustless	*lb.*	.0265†
Heavy compressed (*bags only*)	*lb.*	.0265†
Thermax	*lb.*	.02 / .0475
Velvetex	*lb.*	.022 / .035
"WYEX BLACK"	*lb.*	.0265†
Carbonex	*lb.*	.029 / .034
S	*lb.*	.0315 / .0360

Clays

Aerfloted Paragon (*50-lb. bags*)	*ton*	10.00
Suprex (*50-lb. bags*)	*ton*	10.00
Barden	*ton*	10.00
Chicora	*ton*	10.00
China	*ton*	17.50 /20.00
Crown	*ton*	10.00
Dixie	*ton*	10.00 /22.50
Hi-White	*ton*	10.00
Langford	*ton*	8.50
NcNamee	*ton*	10.00 /22.50
Par	*ton*	10.00
Witco, *c.l.*	*ton*	10.00
Cumar EX	*lb.*	.045
MH	*lb.*	.065 / .11
V	*lb.*	.09 / .12

Reodorants

Amora A	*lb.*	
B	*lb.*	
C	*lb.*	
D	*lb.*	
Compound G-4	*lb.*	
G-11	*lb.*	
Curodex 19	*lb.*	2.75
188	*lb.*	3.50
198	*lb.*	4.50
Para-Dors	*lb.*	
Rodo No. 0	*lb.*	3.50 / 4.00
10	*lb.*	4.50 / 5.00

Rubber Substitutes

Black	*lb.*	.08 / .12
Brown	*lb.*	.08 / .115
White	*lb.*	.085 / .135
Factice		
Amberex	*lb.*	.305
Brown	*lb.*	.08 / .12
Fac-Cel B	*lb.*	.135
C	*lb.*	.135
Neophax A	*lb.*	.095
B	*lb.*	.095
White	*lb.*	.09 / .135

Softeners

Bondogen	*lb.*	.98 / 1.25
Burgundy pitch	*lb.*	.06
Cycline oil	*gal.*	.14 / .20
Dispensing Oil No. 10	*lb.*	.0335/ .036
Nuba resinous pitch (*drums*)		
Grades No. 1 and No. 2	*lb.*	.0265
Nubalene Resin	*lb.*	.025
Palm oil (Witco), *c.l.*	*lb.*	
Pine tar	*gal.*	
Plastogen	*lb.*	.0775/ .10
R-19 Resin (*drums*)	*lb.*	.10
21 Resin (*drums*)	*lb.*	.10
Reogen	*lb.*	.115 / .22
Rosin oil, compounded	*gal.*	.40
RPA No. 1	*lb.*	.65
2	*lb.*	.65
3	*lb.*	.46
Rubtack	*lb.*	.10
Tackol	*lb.*	.085 / .18
Tonox	*lb.*	.52 / .61
Tonox D	*lb.*	.75 / .85
Witco No. 20, *l.c.l.*	*gal.*	.20
X-1 resinous oil (*tank car*)	*lb.*	.01

Softeners for Hard Rubber Compounding

Resin C Pitch 45°C. M.P.	*lb.*	.013 / .014
60°C. M.P.	*lb.*	.013 / .014
75°C. M.P.	*lb.*	.013 / .014

Solvents

Beta-Trichlorethane	*gal.*	
Carbon bisulphide	*lb.*	
tetrachloride	*lb.*	
Cosol No. 1	*gal.*	.25 / .30
No. 2	*gal.*	.20 / .28
No. 3	*gal.*	.20 / .28
Industrial 90% benzol (*tank car*)	*gal.*	.16
Skellysolve	*gal.*	

Stabilizers for Cure

Laurex (*bags*)	*lb.*	.1075/ .1325
Stearex B	*lb.*	.1075/ .1175
Beads	*lb.*	.10 / .11
Stearic acid, single pressed	*lb.*	.1075/ .1175
Stearite, *c.l.*	*100 lbs.*	10.00
Zinc stearate	*lb.*	.24 / .26

Synthetic Rubber

Neoprene Type E	*lb.*	.65
G	*lb.*	.70
GW	*lb.*	.75
H	*lb.*	.78
M	*lb.*	.65
Latex Type 57	*lb.*	.30

(*Continued on page* 88)

TIRE MOLDS



AND MOLDS FOR RUBBER SPECIALTIES AND MECHANICAL GOODS

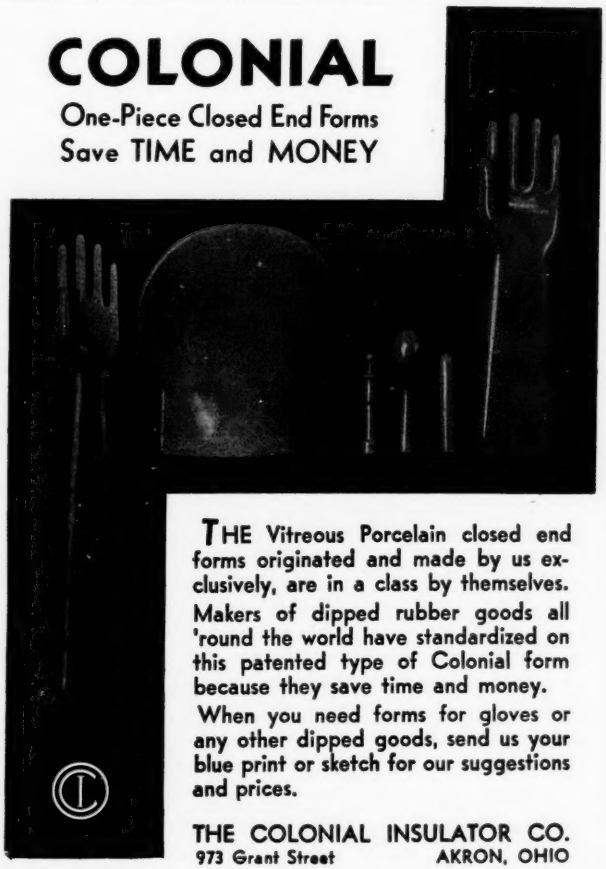
machined in a large modern shop at low prices by specialists in the field. We also build special machinery to your drawings.

Submit inquiries for low quotations.

THE AKRON EQUIPMENT CO.
AKRON - OHIO

COLONIAL

One-Piece Closed End Forms
Save TIME and MONEY



THE Vitreous Porcelain closed end forms originated and made by us exclusively, are in a class by themselves. Makers of dipped rubber goods all 'round the world have standardized on this patented type of Colonial form because they save time and money.

When you need forms for gloves or any other dipped goods, send us your blue print or sketch for our suggestions and prices.

THE COLONIAL INSULATOR CO.
973 Grant Street AKRON, OHIO

Regular and Special Constructions
of

COTTON FABRICS

Single Filling Double Filling
and

ARMY

Ducks

HOSE and BELTING

Ducks

Drills

Selected

Osnaburgs

Curran & Barry

320 BROADWAY
NEW YORK

COTTON AND FABRICS

NEW YORK COTTON EXCHANGE WEEK-END CLOSING PRICES

Futures	Jan. 27	Feb. 24	Mar. 2	Mar. 9	Mar. 16	Mar. 23
Feb.	.....	.....	.....	.....	.....	.....
Mar.	10.95	11.30	11.00	11.15	.....	.....
Apr.	.....	.....	10.88	11.02	10.77	10.83
June	.....	.....	10.60	10.72	10.54	10.62
July	10.29	10.63	10.44	10.55	10.44	10.51
Sept.	9.88	10.19	9.99	10.15	10.02	10.15
Dec.	9.38	9.76	9.46	9.72	9.56	9.79
Jan.	.....	9.73	9.43	9.69	9.51	9.72
Feb.	.....	.....	.....	.....	9.45	9.65

COTTON prices weakened somewhat during March. After closing at 11.43¢ per pound on February 28, the New York $\frac{1}{16}$-inch spot middling price declined to reach 10.92¢ on March 18. Rallying, as hopes of an early peace faded, the price moved up to close at 11.04¢ per pound on March 21. The closing price on March 28 was 10.99¢ per pound, with the market slightly easier.

The Census Bureau reported February consumption of all cotton, exclusive of linters, in domestic mills at 662,659 bales, against 730,143 in January and 562,580 in February, 1939. The February report brought the total used since August 1 to 4,704,504 bales, against 3,959,420 in the comparable period last season. Exports in February were 746,680 bales, against 1,026,628 in January and 263,922 in February, 1939.

A recent statement by Sir Percy Ashley, British cotton controller, indicated that some of Great Britain's wartime purchases of cotton may be shifted from this country to Brazil if a shortage of foreign exchange necessitated such action. Great Britain has been shipped a total of 1,555,303 bales of American cotton for the first seven months of the season, ended February 29, against only 369,785 bales in the first seven months last season.

Fabrics

The demand for fabrics became less active during the past month, with buying limited largely to spot and nearby deliveries for immediate requirements. Rumors of peace, the decline in sterling, and the decline in raw cotton, all played a part in the uncertainty surrounding the market. Stocks in distribution channels were believed to be light. Novelty cloths appear to be the best seller for spring raincoats.

The market is weaker, with price reductions registered in all fabric groups, except hollands, which remained steady. The only fabrics to advance in price were two types of raincoat fabrics.

New York Quotations

March 25, 1940

Drills		
38-inch 2.00-yard	yd.	$0.12
40-inch 3.47-yard		.07¼
50-inch 1.52-yard		.17⅛
52-inch 1.85-yard		.14
52-inch 1.90-yard		.13⅝
52-inch 2.20-yard		.12¼
52-inch 2.50-yard		.11
59-inch 1.85-yard		.13¾
Ducks		
38-inch 2.00-yard D. F.	yd.	.12 /.13
40-inch 1.45-yard S. F.		.16⅞
51½-inch 1.35-yard D. F.		.19¼
72-inch 1.05-yard D. F.		.25¼/.26⅝
72-inch 17.21-ounce		.28
Mechanicals		
Hose and belting	lb.	.26
Tennis		
52-inch 1.35-yard	yd.	.19½
Hollands		
Gold Seal and Eagle		
20-inch No. 72	yd.	.10
30-inch No. 72		.18
40-inch No. 72		.20
Red Seal and Cardinal		
20-inch	yd.	.08½
30-inch		.15¾
40-inch		.17
50-inch		.26
Osnaburgs		
40-inch 2.34-yard	yd.	.10¼
40-inch 2.48-yard		.09⅝
40-inch 2.56-yard		.08⅝
40-inch 3.00-yard		.08⅛
40-inch 7-ounce part waste		.08⅞
40-inch 10-ounce part waste		.12¼
37-inch 2.42-yard		.10
Raincoat Fabrics		
Cotton		
Bombazine 60 x 64	yd.	.07¾
Plaids 60 x 48		.11
Surface prints 60 x 64		.12
Print cloth, 38½-inch, 60 x 64		.05
Sheetings, 40-Inch		
48 x 48, 2.50-yard	yd.	.08½
64 x 68, 3.15-yard		.08
56 x 60, 3.60-yard		.07
44 x 40, 4.25-yard		.05
Sheetings, 36-Inch		
48 x 48, 5.00-yard	yd.	.04½
44 x 40, 6.15-yard		.03½
Tire Fabrics		
Builder		
17¼ ounce 60" 23/11 ply Karded peeler	lb.	.30½
Chafer		
14 ounce 60" 20/8 ply Karded peeler	lb.	.30
9¼ ounce 60" 10/2 ply Karded peeler	lb.	.29½
Cord Fabrics		
23/5/3 Karded peeler, 1$\frac{1}{16}$" cotton	lb.	.31
15/3/3 Karded peeler, 1$\frac{1}{16}$" cotton	lb.	.29
12/4/2 Karded peeler, 1$\frac{1}{16}$" cotton	lb.	.28
23/5/3 Karded peeler, 1¼" cotton	lb.	.36½
23/5/3 Combed Egyptian	lb.	.50
Leno Breaker		
8¼ ounce and 10¼ ounce 60" Karded peeler	lb.	.32½

United States Reclaimed Rubber Statistics—Long Tons

Year	Production	Consumption	Consumption % of Crude	U. S. Stocks*	Exports
1937	185,033	162,000	29.8	28,800	13,233
1938	122,403	120,800	27.6	23,000	7,403
1939	198,815	184,942	32.0	25,427	12,610
1940					
Jan.	20,447	17,596	32.0	25,530	1,059
Feb.	19,060	17,019	34.2	27,019	...

*Stocks on hand the last of the month or year. †Corrected to 100% from estimate of reported coverage.
Compiled by The Rubber Manufacturers Association, Inc.

RUBBER SCRAP

THE scrap market was reported stagnant during March, with activity at a lower level. The market is generally easier, with price declines registered on the following scrap types: all inner tubes, colored boots and shoes, untrimmed arctics, and hard rubber. All other grades continue steady at last month's quotations.

Consumers' Buying Prices

(Carlot Lots for March 22, 1940)

		Prices
Boots and Shoes		
Boots and shoes, black	lb.	$0.01⅛/$0.01¼
Colored	lb.	.00⅞/ .01
Untrimmed arctics	lb.	.00⅞/ .01
Inner Tubes		
No. 1, floating	lb.	.10 / .11
No. 2, compound	lb.	.04⅜/ .04½
Red	lb.	.04⅜/ .04½
Mixed tubes	lb.	.04 / .04⅛
Tires (Akron District)		
Pneumatic Standard		
Mixed auto tires with beads	ton	14.00 /15.00
Beadless	ton	17.50 /18.50
Auto tire carcass	ton	30.00 /35.00
Black auto peelings	ton	26.00 /27.00
Solid		
Clean mixed truck	ton	34.00 /35.00
Light gravity	ton	42.00 /44.00
Mechanicals		
Mixed black scrap	ton	20.00 /22.00
Hose, air brake	ton	20.00 /22.50
Garden, rubber covered	ton	12.50 /14.00
Steam and water, soft	ton	12.50 /14.00
No. 1 red	lb.	.03 / .03¼
No. 2 red	lb.	.02¼/ .02½
White druggists' sundries	lb.	.03¾/ .04
Mixed mechanicals	lb.	.02¼/ .02½
White mechanicals	lb.	.03⅝/ .03¾
Hard Rubber		
No. 1 hard rubber	lb.	.11½/ .13

RECLAIMED RUBBER

ACCORDING to R. M. A. figures, February reclaimed rubber consumption is estimated at 17,019 long tons, 3.3% below that of January; production, 19,060 long tons; and stocks on hand February 29, 27,019 long tons. Demand during March continued at the somewhat reduced level of February. It should be pointed out that while crude rubber consumption dropped 9.4% from January to February, the drop in reclaim consumption was only 3.3%.

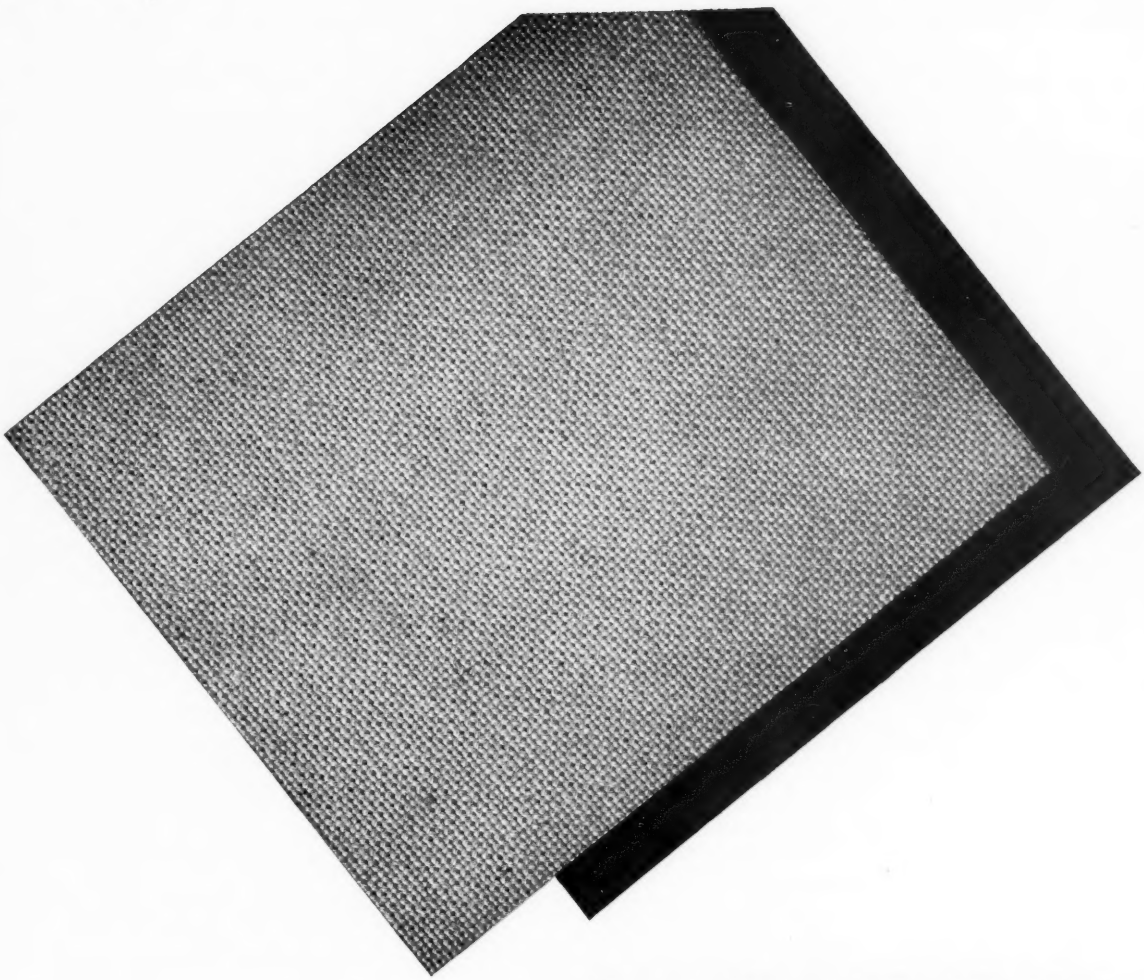
The market continues steady, with all grades of reclaim unchanged in price.

New York Quotations

March 22, 1940

	Sp. Grav.	¢ per lb.
Auto Tire		
Black Select	1.16-1.18	6 / 6¼
Acid	1.18-1.22	7 / 7¼
Shoe		
Standard	1.56-1.60	6½/ 6¾
Tubes		
Red Tube	1.15-1.30	9 / 9¼
Compound	1.10-1.20	9 /10
Miscellaneous		
Mechanical Blends	1.25-1.50	4½/ 5
White	1.35-1.50	12½/14

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity at special prices.



SHAWMUT CHAFER FABRIC

Through the successful combination of expert craftsmanship, modern equipment and careful attention to every detail in the process of manufacture, we have established our reputation as producers of satisfactory fabrics for the rubber industry. Shawmut Chafer fabric is one of the many fabrics we supply the rubber industry. Our textile engineers are always available to aid in the development of special specification fabrics to meet unusual requirements.

WELLINGTON SEARS COMPANY

65 WORTH STREET NEW YORK, N. Y.

Accelerators and Plastics

(*Continued from page 63*)

the history and development of plastic materials up to the present time, centering his discussion on the phenol formaldehyde type. Speaking of recent rapid progress in the field, he showed that consumption of plastics in this country grew from 144,000,000 pounds in 1936 to 300,000,000 pounds in 1939. The speaker minimized the competitive position of rubber and plastics and pointed out that both types of materials are continually finding new and important applications. Numerous specimens of plastics products on display were discussed in quite some detail. A sound film, "The Fourth Kingdom," which told the story of Bakelite, its chemistry, manufacture, and uses, was also shown by Mr. Vail.

Prize winners in the bowling tournament were: Walter Miller (Carr Mfg.)—high single string; E. L. Hanna (Davol)—high two strings; and consolation prize—David Scott, Jr., (Henry L. Scott). Bowling prizes and five door prizes were made available through the donations of the following concerns: E. I. du Pont de Nemours & Co., Inc.; Firestone Rubber & Latex Products Co.; Monsanto Chemical Co.; C. P. Hall Co.; New Jersey Zinc Sales Co.; and R. T. Vanderbilt Co.

Latac—Active Latex Accelerator

LATAC, a new accelerator for latex, said to be highly active at all temperatures when used either alone or as a secondary accelerator, was recently announced by E. I. du Pont de Nemours & Co., Inc., Rubber Chemicals Division, Wilmington, Del. Chemically, Latac is hexamethylene ammonium hexamethylene-dithiocarbamate. Good aging properties, enhanced by use with Zenite, are said to be obtained, and Latac does not impart any odor or color to the rubber. High modulus is also characteristic of stocks accelerated with it. It has low solubility in water (1.08 grams per 100 cubic centimeters at 20° C.; five grams at 75° C.) and therefore, is added in hot aqueous solution to latex. Too fast and scorchy for general use in milled rubber compounding, Latac has special application for self- and continuous-curing milled rubber stocks when handled by the split-batch method.

Tackifiers for Latex Adhesives

VISTAC is a viscous synthetic oil, said to be readily emulsified for addition to latex to impart tackiness. Because the material is a completely saturated hydrocarbon, it will not oxidize and therefore lose its tackiness upon aging. Vistac is substantially free from color, taste, odor, and staining.

While Vistac is, in itself, useful in the improvement of tack in latex, greater tackiness and strength are achieved when Vistac is blended with a material known as Resin V. Vistac or Vistac-Resin V blends may be readily emulsified by oleic acid and ammonia or triethanolamine. The emulsions may be blended in latex in any proportion. Both materials are distributed by Advance Solvents & Chemical Corp., 245 Fifth Ave., New York, N. Y. Suggested uses with latex are: shoe adhesives, dry combining of fabrics, etc., adhesive tapes, cohesive bandages, stationers' adhesives, dry "welding," and wherever the use of a tacky latex adhesive is indicated.

Canadian Rubber Section Sees Two Carbon Black Films

MEETING on February 23 at the University of Toronto, Toronto, Ont., the Rubber Section, Canadian Chemical Association, viewed two movies on carbon black, shown by Godfrey L. Cabot, Inc. The first was a colored film depicting bulk shipment from Corpus Christi, Tex., to Boston, Mass.; while the second, the sound picture, "Inside the Flame," was on carbon black production. Attendance at the meeting totaled 53, and at the dinner earlier, 40. Following the meeting, those present were invited to be guests of the Cabot company at the Royal York Hotel, where refreshments were served.

Addition to Plasticity Story

Wm. M. Widenor writes that in his prize-winning essay, "The Measurement of the Plasticity of Rubber,"[1] he did not mention the work of Speedy[2] who, using the Widney resiliometer, a form of compression plastometer, measured the plasticity of unvulcanized rubber as far back as 1918.

[1] INDIA RUBBER WORLD, Nov. 1, 1939, pp. 41-46.
[2] *J. Soc. Chem. Ind.*, 39, 18T (1929); *India Rubber J.*, 89, 342 (1935).

"List of Inspected Fire Protection Equipment and Materials, January, 1940." Underwriters' Laboratories, Inc., 207 E. Ohio St., Chicago, Ill. 151 pages. This list, which replaces similar previous lists, includes cotton rubber-lined fire hose and also rubber-containing chemical engine hose.

Current Quotations

(*Continued from page* 84)

Tackifier

B.R.H. No. 2	*lb.*	.017 / .02

Varnish

Shoe	*gal.*	1.45

Vulcanizing Ingredients

Sulphur Chloride (*drums*)	*lb.*	.035 / .04
Rubber	100 *lbs.*	2.00
Telloy	*lb.*	1.75
Vandex	*lb.*	1.75
(See also Colors—Antimony)		

Waxes

Carnauba, No. 3 chalky	*lb.*	
2 N.C.	*lb.*	
3 N.C.	*lb.*	
1 Yellow	*lb.*	
2	*lb.*	
Montan, crude	*lb.*	

Shipments of Crude Rubber from Producing Countries—Long Tons

Year	Malaya including Brunei and Labuan	N.E.I.	Ceylon	India	Burma	North Borneo	Sarawak	Thailand	French Indo-China	Total	Philippines and Oceania	Liberia†	Other Africa	South America	Mexican Guayule	Grand Total
1937.....	469,900	431,700	70,400	9,800	7,200	13,200	25,900	35,600	43,400	1,107,100	1,600*	2,300	9,100	16,300	3,400	1,139,800
1938.....	372,046	298,100	49,500	8,500	6,700	9,500	17,800	41,600	59,200	862,900	2,000*	2,900	9,000*	15,300	2,800	894,900
1939.....	376,755	372,396	61,023	9,241	6,616	11,864	24,014	41,266	65,219	968,394	2,048*	6,102	9,600*	16,094	2,916	1,005,154
1939																
Jan.	24,393	39,049	7,237	764	1,115	1,604	2,342	2,918	4,532	83,954	220	528	800	1,812	347	87,661
Feb.	29,278	25,006	5,495	947	618	664	1,484	5,606	5,293	74,391	158	435	800	1,187	319	77,290
Mar.	29,298	27,934	3,718	773	619	344	1,177	5,401	4,501	73,765	230	427	800	1,407	210	76,839
Apr.	29,779	28,341	2,225	881	379	1,687	2,446	2,660	2,657	71,055	135	533	800	1,206	167	73,896
May	29,598	24,429	2,805	1,002	668	558	1,649	2,782	4,584	68,075	129	500*	800	1,077	231	70,812
June	22,052	27,511	3,708	630	805	332	1,157	1,748	4,663	62,606	137	667	800	676	166	65,052
July	26,013	35,681	5,019	782	503	1,603	3,092	5,599	3,367	81,659	190	516	800	1,071	264	84,500
Aug.	40,973	27,478	5,620	203	213	975	1,749	5,230	7,020	89,461	234	222	800	1,313	378	92,408
Sept.	26,908	37,717	6,064	691	89	429	1,932	4,670	5,943	84,443	94	599	800	1,356	138†	87,430
Oct.	49,458	45,005	5,234	665	150	1,730	2,487	2,047	5,022	111,798	122	561	800	1,524	282†	115,087
Nov.	35,773	30,325	4,402	370	449	1,322	2,023	1,428	6,540	82,632	249	614	800	1,198	214†	85,707
Dec.	33,232	23,920	9,496	1,533	1,008	616	2,476	1,177	11,097	84,555	150*	500*	800	2,267	200*	88,472
1940																
Jan.	26,229	54,336	7,698	872	833	1,858	2,517	5,722	5,238	105,303	200*	600*	900	1,072	200*	108,275

*Estimated. †Guayule rubber imports into U.S.A. provisional until export figures from Mexico are received. Source: *Statistical Bulletin of the International Rubber Regulation Committee.*

CLASSIFIED ADVERTISEMENTS

ALL CLASSIFIED ADVERTISING MUST BE PAID IN ADVANCE

GENERAL RATES	SITUATIONS WANTED RATES	SITUATIONS OPEN RATES
Light face type $1.00 per line (ten words)	Light face type 40c per line (ten words)	Light face type 75c per line (ten words)
Bold face type $1.25 per line (eight words)	Bold face type 55c per line (eight words)	Bold face type $1.00 per line (eight words)

Allow nine words for keyed address. *Replies forwarded without charge.*

SITUATIONS WANTED

CHEMIST WITH 22 YEARS' VARIED EXPERIENCE IN COMpounding, testing, consulting, and reclaiming. Last work on the preparation and evaluation of mineral fillers. Address Box No. 86, care of INDIA RUBBER WORLD.

MAN WITH 20 YEARS' EXPERIENCE IN RUBBER COMPOUNDing and operating calenders and mills. Capable foreman or calender operator for tires, tubes, and other products. Address Box No. 87, care of INDIA RUBBER WORLD.

FACTORY MANAGER, COLLEGE GRADUATE, CHEMIST, THOROughly experienced in manufacture of both soft and sponge rubber products, also in synthetics, seeks a suitable position. Holds similar position now. Address Box No. 89, care of INDIA RUBBER WORLD.

YOUNG MAN, AGE 34, WITH 12 YEARS' EXPERIENCE AS FOREman in inner tube and molded goods department, desires connection. Go anywhere. Responsible. Address Box No. 91, care of INDIA RUBBER WORLD.

RUBBER CHEMIST, ELEVEN YEARS' EXPERIENCE IN COMpounding development and factory processing, mainly on footwear and extruded goods. Some experience with latex and synthetics. Would consider technical sales. Address Box No. 94, care of INDIA RUBBER WORLD.

Where Needs Are Filled

The Classified Ad. Columns of INDIA RUBBER WORLD bring prompt results at low cost.

SITUATIONS OPEN

WANTED: PRODUCTION MAN,

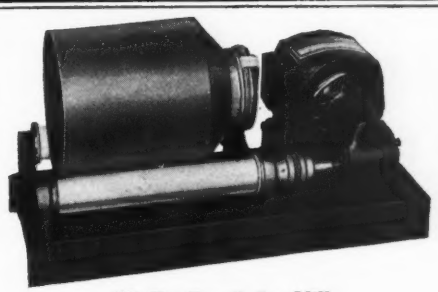
Middlewest, manufacturer with national reputation, molded hard and sponge rubber products, wants a thoroughly competent production man, capable of taking entire charge of factory. Person desired is probably now a number two man in a large company, but finds progress blocked by tradition or other reason. Applicant should give complete personal history together with references and entire business career. All applications will be treated in strictest confidence. Address Box No. 88, care of INDIA RUBBER WORLD.

WANTED: A GRADUATE CHEMIST WITH RUBBER EXPERIence to sell chemicals to the rubber industry. Selling experience essential. Our employes know of this advertisement. Address Box No. 93, care of INDIA RUBBER WORLD.

FOSTER D. SNELL, INC.
Chemists—Engineers
Every form of Chemical Service
305 Washington Street Brooklyn, N. Y.

"ROLLER-TYPE" JAR MILLS

ARE SAFER TO HANDLE, EASIER TO USE AND SAVE YOU MONEY



"Roller-Type" Jar Mill

Compare the amazingly low price of our "Roller-Type" Jar Mills with the usual type of Jar Mill.

See how much more economical they are, size for size, how much easier and safer they are to use, how sturdy and rugged their construction. NOTE THE JARS REQUIRE NO CUMBERSOME CLAMPING INTO FRAME OR HOUSING — JUST SETTING THE JARS ON THE REVOLVING RUBBER-COVERED ROLLERS — nothing more.

Standard sizes accommodate one, two, three or four "Loxeal" Jars, either of the 1, 1½ or 2 Gal. size. Larger sizes to order.

Write today for Bulletin No. 267 which describes and illustrates our "Roller-Type" Jar Mills, "U. S. Standard" Jar Mills, Ball Mills, Mill Jars, Steel Jacketed Porcelain Grinding Jars and "Loxeal" Mill Jars.



Electric "Tumbelmixer"

Our Electric "TUMBELMIXERS" are being used for the acid washing of golf balls, syringes, rubber parts, etc., as well as for the mixing of latex solutions, etc. Write for Bulletin 275.

THE U. S. STONEWARE CO.
WORKS (SINCE 1865) AKRON OHIO

(*Advertisements continued on page* 91)

United States Statistics

Imports for Consumption of Crude and Manufactured Rubber

	December, 1939		Twelve Months Ended December, 1939	
	Quantity	Value	Quantity	Value
UNMANUFACTURED—*Free*				
Liquid latex (solids)....*lb.*	6,215,307	$1,127,924	61,460,003	$10,467,552
Jelutong or pontianak....*lb.*	1,086,379	126,548	14,873,449	1,603,418
Balata ....*lb.*	143,998	38,781	1,554,866	265,553
Gutta percha ....*lb.*	873,088	89,635	3,908,675	539,255
Guayule ....*lb.*	529,000	51,521	5,001,000	463,345
Scrap and reclaimed....*lb.*	1,391,502	44,836	11,439,908	230,123
Totals	10,239,274	$1,479,245	98,237,901	$13,569,246
Misc. rubber (above), 1,000 *lbs.*	10,239	$1,479,245	98,238	$13,569,246
Crude rubber....1,000 *lbs.*	153,181	25,861,354	1,052,359	167,558,245
Totals ....1,000 *lbs.*	163,420	$27,340,599	1,150,597	$181,127,491
Chicle, crude ....*lb.*	1,865,807	$636,927	14,679,050	$5,151,455
MANUFACTURED—*Dutiable*				
Rubber tires ....*no.*	3,197	$27,439	28,996	$131,849
Rubber boots, shoes and overshoes ....*prs.*	2,220	736	21,877	5,562
Rubber soled footwear with fabric uppers ....*prs.*	99,036	13,224	863,033	151,270
Golf balls ....*no.*	26,148	2,607	692,325	65,293
Lawn tennis balls....*no.*	11,340	946	1,084,535	117,882
Other rubber balls....*no.*	200,660	6,876	2,909,837	98,050
Other rubber toys....*lb.*	4,812	724	247,214	39,292
Hard rubber combs....*no.*	.....	.....	596,037	44,809
Other manufactures of hard rubber	.....	811	.....	27,388
Friction or insulating tape.*lb.*	2,540	2,835	128,077	32,811
Belts, hose, packing, and insulating material	.....	3,006	.....	75,188
Druggists' sundries of soft rubber	.....	979	.....	51,464
Inflatable swimming belts, floats, etc. ....*no.*	42,161	2,671	618,054	39,347
Other rubber and gutta percha manufactures	.....	16,523	.....	428,907
Totals	.....	$79,377	.....	$1,309,112

Exports of Foreign Merchandise

RUBBER AND MANUFACTURES				
Crude rubber ....*lb.*	2,499,236	$529,759	29,399,900	$5,832,618
Balata ....*lb.*	63,054	20,194	234,329	63,104
Other rubber, rubber substitutes and scrap....*lb.*	57,009	8,002	273,578	20,527
Rubber manufactures (including toys)	.....	4,821	.....	27,282
Totals	.....	$562,776	.....	$5,943,531

Exports of Domestic Merchandise

RUBBER AND MANUFACTURES				
Reclaimed ....*lb.*	3,763,648	$185,839	28,246,152	$1,426,277
Scrap ....*lb.*	5,652,623	109,417	96,790,687	1,535,178
Cements ....*gal.*	57,294	57,871	603,409	748,865
Rubberized auto cloth.*sq. yd.*	18,904	10,848	198,881	103,366
Other rubberized piece goods and hospital sheeting.*sq. yd.*	232,235	84,308	2,813,767	1,022,971
Boots ....*prs.*	9,644	22,510	97,978	215,159
Shoes ....*prs.*	6,860	5,627	174,174	107,007
Canvas shoes with rubber soles ....*prs.*	34,023	25,687	627,281	421,753
Soles ....*doz. prs.*	5,854	12,315	48,143	101,553
Heels ....*doz. prs.*	36,404	22,094	459,162	256,465
Soling and top lift sheets.*lb.*	92,054	18,469	872,051	163,901
Gloves and mittens..*doz. prs.*	11,020	26,857	123,990	266,019
Water bottles and fountain syringes ....*no.*	37,571	11,975	294,495	100,689
Other druggists' sundries...	.....	72,273	.....	821,400
Gum rubber clothing....*doz.*	18,333	38,384	276,042	615,389
Balloons ....*gross*	39,041	28,242	432,918	335,916
Toys and balls	.....	23,666	.....	209,801
Bathing caps ....*doz.*	3,432	6,234	55,379	107,443
Bands ....*lbs.*	23,470	11,520	242,267	100,676
Erasers ....*lb.*	29,730	18,239	310,636	176,572
Hard rubber goods				
Electrical battery boxes.*no.*	29,871	20,472	226,366	161,356
Other electrical....*lb.*	46,940	18,029	321,058	94,635
Combs, finished ....*doz.*	12,623	6,451	186,279	109,476
Other hard rubber goods...	.....	9,057	.....	160,117
Tires				
Truck and bus casings.*no.*	51,464	1,072,340	404,386	8,095,210
Other auto casings....*no.*	68,207	696,360	779,166	8,190,150
Tubes, auto ....*no.*	81,222	154,004	849,412	1,415,866
Other casings and tubes.*no.*	11,306	87,774	128,569	995,553
Solid tires for automobiles and motor trucks....*no.*	104	3,401	3,672	63,438
Other solid tires....*lb.*	11,804	3,340	175,681	40,836
Tire sundries and repair materials ....*lb.*	303,937	89,591	3,094,756	882,765
Rubber and friction tape..*lb.*	97,661	22,960	732,907	207,873
Fan belts for automobiles.*lb.*	38,633	18,776	625,041	359,384
Other rubber and balata belts ....*lb.*	452,414	229,248	3,311,911	1,790,350
Garden hose ....*lb.*	67,986	12,858	1,025,893	213,139
Other hose and tubing....*lb.*	1,510,624	615,611	10,257,126	4,019,288
Packing ....*lb.*	172,765	70,333	1,473,230	634,864
Mats, matting, flooring, and tiling ....*lb.*	132,397	18,214	1,317,922	193,148
Thread ....*lb.*	68,471	69,227	666,206	581,056
Gutta percha manufactures.*lb.*	119,206	34,235	1,506,933	441,230
Other rubber manufactures..	.....	268,300	.....	1,880,916
Totals	.....	$4,311,956	.....	$39,367,050

Foreign Trade Information

For further information concerning the inquiries listed below address United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Room 734, Custom House New York, N. Y.

No.	COMMODITY	CITY AND COUNTRY
*6427	Druggists' sundries	Cairo, Egypt
*6430	Druggists' sundries	Cairo, Egypt
†6450	Insulated cables and wires....	Stockholm, Sweden
*6452	Elastic webbing	Mexico City, Mexico
†6455	Unvulcanized rubber for stamps....	Karlstad, Sweden
*6456	Druggists' sundries, bathing caps, heels, imitation leather handbags....	Alexandria, Egypt
‡6495	Insulated cables and wires....	Paramaribo, Surinam
†6496	Rubber gaskets for preserve jars....	Brussels, Belgium
*6519	Elastic webbing	Monterrey, Mexico
*6520	Automobile accessories, storage batteries, imitation leather for automobile upholstery, and hood cloth....	Batavia, Java
†6521	Linen fire hose	Rangoon, Burma
*6551	Rubber heels, toys, balloons, insulated cables and wires	Cairo, Egypt
†6558	Bicycle tires and accessories....	Toronto, Canada
†6564	Insulated cables and wires, wiring materials and supplies	Quito, Ecuador
*6571	Druggists' sundries	Alexandria, Egypt
*6572	Surgical rubber goods....	Cairo, Egypt
*6582	Automobile tires, batteries and accessories, sporting goods and equipment	Cairo, Egypt
*6587	Women's elastic satin bathing suits....	Johannesburg, South Africa
†6598	Electric wiring, plugs, sockets....	Batavia, Java
‡6611	Tires and storage batteries....	Paramaribo, Surinam
*6612	Insulated wire and cables....	Montevideo, Uruguay
†6615	Surgical and hospital rubber supplies..	Brussels, Belgium
†6619	Dental supplies and dental acrylic resin	Toronto, Canada
*6632	Elastic materials, rubberized cloth for raincoats, and girdles	Montevideo, Uruguay
*6660	Insulated cables	Athens, Greece
‡6664	Automobile tires, accessories, and parts	Cairo, Egypt
†6669	Rubber belting and joints, pipes, and cables	Brussels, Belgeum
†6673	Insulated copper wire	San Jose, Costa Rica

*Agency. †Purchase. ‡Purchase and agency. ¶Purchase or agency.

Rubber Trade Inquiries

The inquiries below are of interest not only in showing the needs of the trade, but because additional information may be furnished by readers. The Editor is glad to have those interested communicate with him.

No.	INQUIRY
2738	Manufacturers of mixers and spreaders.
2739	Manufacturer of an inflated, life-size, human rubber form.
2740	Manufacturers of hard rubber funnels for acid use.
2741	Supplier of Drednaut Protectocote.
2742	Manufacturer of the Flexi-Cap.
2743	Manufacturers of rubber bulbs for jostling and tilting poles.

Trade Lists Available

The Commercial Intelligence Division recently compiled the following trade lists, of which mimeographed copies may be obtained by American firms from the U. S. Bureau of Foreign and Domestic Commerce or its district or cooperative offices by referring to the titles. The price is 10¢ a list for each country.

Automotive products, manufacturers, Egypt.
Dental supply houses, Thailand.
Electric suppliers and equipment, importers and dealers, Egypt and Cyprus, Philippine Islands, and Panama.
Electric wire and cable, manufacturers, Yugoslavia.
Rubber goods, manufacturers, Netherlands.
Sporting goods, importers and dealers, Egypt.
Tire rebuilders and retreaders, British Malaya.

Imports by Customs Districts

	January, 1940 *Crude Rubber		January, 1939 *Crude Rubber	
	Pounds	Value	Pounds	Value
Massachusetts	13,401,326	$2,257,118	14,072,060	$2,337,973
New York	104,858,076	18,162,197	46,886,292	7,324,430
Philadelphia	8,496,266	1,307,071	746,111	123,652
Maryland	12,317,960	2,041,299	1,449,860	202,297
Virginia	22,432	4,038	.....	.....
Georgia	.....	.....	328,037	45,430
Mobile	215,000	30,517	978,335	144,333
New Orleans	6,038,973	1,020,776	2,830,526	412,572
Galveston	101,137	18,535	22,400	3,455
El Paso	43,000	4,223	89,800	8,798
Los Angeles	13,727,819	2,362,495	14,532,205	2,196,818
San Francisco	1,261,780	207,371	749,370	117,363
Ohio	1,851,086	331,122	.....	.....
Oregon	.....	.....	32,400	5,398
Colorado	56,217	8,367	347,260	39,994
Totals	162,391,072	$27,755,129	83,064,656	$12,962,513

*Crude rubber including latex dry rubber content.